

METROPOLITAN CANBERRA

POLICY PLAN

DEVELOPMENT PLAN

NATIONAL
CAPITAL
DEVELOPMENT
COMMISSION

CANBERRA JULY 1984

Metropolitan Canberra

Policy Plan Development Plan

National
Capital
Development
Commission

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Foreword

The Commission's first metropolitan planning report was published in 1965 under the heading of *The Future Canberra*. Its objective was to define a pattern of future urban development sufficient to accommodate an ultimate population of 250 000, and to create a structure of separate urban districts which would avoid the adverse consequences of urban sprawl. The 1965 Outline Plan made provision for 'satellite towns' to be developed at Woden, Belconnen and Majura, separated from one another and from existing urban areas at North and South Canberra by continuous non-urban (rural) belts and recreational open spaces.

In 1970 the Commission published a revised metropolitan plan under the heading of *Tomorrow's Canberra*. This was the so-called 'Y-Plan' which rearranged the satellite towns into a linear pattern in order to obtain a more efficient transport system. The Y-Plan was influenced by the application of land use/transport planning techniques which were popular amongst engineers and town planners in the 1960s. It reflected the clear acceptance of the private car as the principal mode of transport for all trips, particularly the journey-to-work. It also aimed at the segregation of the private car network and the public transport network with the object of keeping public transport movements as free as possible from traffic congestion. In particular, an objective of the Plan was to protect the essential features of the Griffin Plan and maintain a dignified setting in the Central Area for the Parliament.

Unlike metropolitan planning schemes prepared for other Australian cities the Y-Plan has, for the most part, been closely adhered to and has worked much as the planners intended at the time it was formulated in the late 1960s.

When the time came to review the Y-Plan towards the end of the 1970s it became increasingly apparent to the Commission that it was no longer possible to produce a single report on metropolitan planning that would do justice to all of the key issues. Physical expansion was no longer the most important issue in the way that it had been in 1965 and 1970 when the two previous reports had been prepared. Social and economic issues were now more pressing.

As a consequence the Commission in 1980 published a Discussion Paper in order to elicit views from the community on a variety of metropolitan planning issues occurring in physical, social and economic realms. As a result of the submissions received the Commission decided that it would produce a series of reports on a fairly regular basis dealing with different but related aspects of metropolitan planning and development. The more significant reports which have been published since 1980 have dealt with the following:

- Civic Centre Policy Plan and Development Plan
- Parliamentary Zone Development Plan (two reports)
- Murrumbidgee River Corridor Draft Policy Plan and Development Plan.

This present report is intended to be an 'overview' document which draws on some of the material previously published in the 1980 Discussion Paper, but updated to reflect recent trends and the latest demographic data from the 1981 census. It is not meant to be an exhaustive report on all aspects of metropolitan planning. More detailed information is - or will be - contained in specific reports on designated areas or explicit issues of the kind indicated above. In some instances there are bound to be gaps in the sense that some issues, particularly in social and economic realms, can be identified as problems but the solutions are either not clear to the Commission or lie outside the scope of its statutory responsibilities. In such circumstances the Commission tries to act in an advocacy role or seeks to establish collaborative arrangements as a way of tackling complex social and economic problems, thus it is necessary to look beyond the scope of this report in relation to such matters.

This report confirms the basic structure of the Y-Plan as a continuing and valid basis for guiding metropolitan development at population capacities up to 400 000. It indicates that as Canberra's population reaches a level of 250 000 in a few years time, and as remaining lands in Tuggeranong are serviced and occupied, it is necessary to start now the planning and development of a fourth 'new town' at Gungahlin. In addition the existing commercial retail centres at Civic and Woden are fast approaching employment/accessibility thresholds which means that - particularly in the case of Civic - major investment in roads, public transport and parking facilities will be needed from now on in order to maintain their functional effectiveness in infrastructure terms. Otherwise congestion, air pollution and other adverse environmental impacts will increasingly be experienced.

Such issues are touched on in this report but will be the subject of further, more detailed, reports as current study programmes are completed. In particular, reports on the Tuggeranong Town Centre, Gungahlin and the Parliamentary Zone will be published progressively over the next year or so. The concept of the National Capital Open Space System will be further refined in conjunction with the Department of Territories and Local Government, and a report published for public discussion covering both the development and management aspects.

The Commission is aware of the fact that, periodically, different community groups raise fundamental questions about the validity of specific principles or policies contained in the Y-Plan and it is conscious of the possibility that some of these questions might not be satisfactorily dealt with in this report. To some extent this happens either because the question posed is inherently difficult to answer or because it could take months or even years of investigation to validate.

In other words there are limitations on what planners can hope to achieve in their efforts to satisfy the diverse needs and demands of their client communities. While it is not possible to produce a metropolitan plan that will be 'all things to all men' it is reasonable to expect, however, that the Commission as the authority responsible for the planning and development of the National Capital does provide clear statements of its policies and an explanation of their underlying reasoning. This is what this report aims to do.

In the final analysis the crucial judgements to be made about planning are whether or not Canberra provides a large measure of satisfaction as an environment for living so far as its residents are concerned, and as an effective seat of government so far as the Parliament and the executive government are concerned. In the Commission's opinion it does achieve both these things in large measure and has good prospects for continuing to do so.

A.J.W. POWELL
Commissioner

July 1984

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Background

Canberra has a history of long-term metropolitan planning. In 1911 the Federal Government launched a world-wide design competition to produce a plan of layout for Canberra as the Seat of Government and National Capital of Australia. The competition was won by Walter Burley Griffin, an architect and landscape designer and his plan for a city of 75 000 was far sighted, serving Canberra until the mid-1950s. The Griffin Plan was concerned primarily with the formal layout of the Central Area as a setting for the Parliament House and location of the main functions of government. The Plan also established a number of important principles relating to the pattern of urban development and its relation to topographic and landscape elements, which have been incorporated into all subsequent plans for the City.

When the Commission was established in 1957, its immediate tasks were to assume responsibilities for those projects already in progress, establish a construction programme for the approved public service transfers and consequent development and to launch the necessary long-term planning studies for the future extension of the City. Preliminary forecasts made by the Commission when it first assumed office indicated that the population of the Canberra City Area would reach 100 000 by June 1974. The results of the 1959 Population Count provided more precise information concerning the rate of public service transfers, and more detailed research into population growth showed the original estimate to be conservative. The Commission was faced with the problem of a population of 100 000 being reached by 1969-70.

Given this situation and the fact that the Griffin Plan was only intended to accommodate 75 000 people, the Commission undertook a series of studies to define a long-term metropolitan strategy for the future expansion of the City. These studies indicated that the choice lay between the intensification of densities at existing population centres coupled with the extension of the urban fringe areas in the traditional growth pattern of Australian cities or preserving the open character of the City by limiting the extent of the existing population area and forming new residential districts in the surrounding rural areas.

The Commission chose the latter and produced an Outline Plan for a population of 250 000 and a diagram showing possible growth patterns beyond this level. The main reason for this choice was that it preserved the integrity of the Griffin Plan along with Griffin's concept that Canberra should be a Garden City in a landscaped setting with the topography the dominant element in the City structure.

In 1963, Rankine and Hill and De Leuw Cather undertook the Canberra Area Transportation Study (CATS) to examine the Outline Plan for 250 000 people. The study showed that the Plan would break down when growth occurred beyond this level, and it was recognised that a new plan would be needed to cater for Canberra's long term

growth prospects. In 1965 Alan Voorhees was approached to undertake a study to develop a series of long-term test plans and to evaluate their relative effectiveness.

Analysis of the test plans resulted in the development of the Y-Plan which was published in *Tomorrow's Canberra* in 1970 (Figure 1).

In 1980 the Y-Plan was reviewed and the Commission concluded that it was a viable strategy at least up to a population level of 500 000 people. Within the broad framework of the Y-Plan there were, however, a number of important policy and development issues which needed resolution. These issues were canvassed in the *Metropolitan Issues-Public Discussion Paper* which was published in 1980. The most important question raised in this report was the location and staging of future development. One aspect of this was the issue of whether or not West Murrumbidgee should be developed and if so, how adverse environmental impacts should be handled.

Since the Metropolitan Issues Report was published in 1980, continuing studies by the Commission, coupled with a resurgence of development and employment growth, have shown that by the end of this decade it will be necessary to have population settlement in the new town of Gungahlin. This has significant implications for both the government and private sector in terms of funding and investment decisions. From the viewpoint of government, considerable funds will be required to finance major urban infrastructure, especially hydraulic services and roads and for land servicing.

Also by 1990 the overall operational requirements of the City are likely to result in the need for additional funds and investment to upgrade the metropolitan road network, to provide additional public transport facilities and to provide for structured car parking at major metropolitan shopping and employment centres.

The key issues dealt with in this Report relate to the location and staging of population settlement and employment centres, the provision of major retail facilities, the provision of a metropolitan park through the establishment of a National Capital Open Space System and the provision of a metropolitan road network and public transport system. Related key issues are the preservation of the natural environment, in particular the preservation of the Murrumbidgee River and the land immediately to the west in Tuggeranong, the need to ensure adequate air and water quality and the costs associated with maintaining and protecting the intrinsic value of the existing built environment, in particular the Central Area which contains the main activities of the Parliament and the government.

While this Report discusses many of these issues and proposes steps to resolve them through forward planning, development programmes and policies, several issues remain unresolved. The Commission recognises that ultimately certain of these remaining issues involve political decisions which must be made by governments, influenced to some extent by the Commission's technical assessments and community opinion and representation. Other issues, such as redevelopment of inner-city areas are referred to in the Report, but not conclusively dealt with because by their very nature, they demand an iterative approach to the formulation of detailed planning policies and development control.

Any plan for Canberra cannot be implemented by the NCDC alone. Such a plan will need the guidance and support of the Australian Parliament through the Joint Parliamentary Committee on the ACT; the people of Canberra through the ACT House of Assembly; the Department of Territories and Local Government; the Canberra Development Board; and other government agencies involved with Canberra's development. It will need the continued support of Canberra's private enterprise sector which makes major investment



Figure 1 Strategy Plan for Metropolitan Growth (The Y-Plan)



Figure 2 The Planning Area

decisions. It will also require support from the various private sector organisations such as the Canberra Association for Regional Development, the Chambers of Commerce and other business associations.

Purposes of the Report

- The purposes of the Metropolitan Planning Report are to:
- describe the background to the existing Metropolitan Plan (Y-Plan)
 - describe the existing land-use structure of the City and the location of key activities
 - prepare forecasts of future growth and change
 - predict the future needs of the City based on such forecasts
 - show how these needs can be accommodated in alternative plans and analyse the implications of the alternatives
 - describe a preferred strategy for future growth and change indicating the main metropolitan policies and development programmes needed to guide the long-term development of Canberra
 - describe how the public and private sectors can carry out urban development both jointly and individually.

The Planning Area

The planning area for this report is the Australian Capital Territory. The subject matter is mainly concerned with Metropolitan Canberra which comprises the existing urban areas of Canberra plus those settlement areas which will accommodate the population expected during the next twenty years. Population, employment, land, housing, retailing and transport have all been analysed on this basis.

The planning area is shown in Figure 2.

Introduction

The Commission's role is to formulate planning policies and to carry out development which meets the social and economic needs of the resident and business community. It is the Commission's aim to have policies and development programmes which are complementary to private enterprise investment.

The Plan for Metropolitan Canberra comprises both a Policy Plan and a Development Plan. The subject matter of the Plan can be described as follows.

- The Plan focuses on physical development. It meets a specific need to provide advice on physical development and should be understood as being complementary to other planning activities within the City.
- The Plan is long range. It focuses on the future needs of the community, insofar as it is possible to make reasonable judgements as to what these needs will be. The Plan can be seen as a statement of long-term targets to which short-term decisions should be geared. As conditions and circumstances change, the targets might also change.
- The Plan is comprehensive with respect to physical elements of the urban environment.
- The Plan relates the major physical proposals to the basic policies of the Plan.

The Plan thus deals with the overall physical planning and development of Canberra, although it also considers social and economic aspects.

The Metropolitan Policy Plan and Metropolitan Development Plan essentially comprise the Commission's strategic plan, which not only illustrates the physical and functional end-result, which is an urban development pattern, but also defines the policy base for regulating both public and private sector development. The Metropolitan Policy Plan shows the principles and policies adopted by the Commission to guide future urban development and to regulate redevelopment.

Nature and Contents of the Report

The Report covers four main aspects, namely:

- background, which outlines the Y-Plan, and the review of the Plan which has occurred over the past four years
- the existing situation and forecast change
- the generation and evaluation of alternative plans for Metropolitan Canberra leading to a preferred plan for the long-term development of Canberra
- planning policies and development programmes needed to implement the preferred plan.

The existing situation is described in terms of the major metropolitan structural elements, such as land and housing, retailing, transport, etc. Relevant trends have been analysed in terms of demographic, economic, land use and transport factors, in order to identify likely future needs.

In the light of such needs, forecasts of future development have been formulated and alternative plans have been derived to show how development might be accommodated within the next twenty years, which is the plan period for this Report.

The preferred plan has been prepared as a Policy Plan to indicate the Commission's intended location for future development in Canberra. A Development Plan has been prepared to show how the more significant policies might be implemented by both the public and private sectors.

Policy Plans comprise broad statements of planning policy, as a basis for making decisions about urban development by both the public and the private sector. Where possible, the objectives and principles underlying the policies are indicated, as well as the environmental and town planning standards to be met.

Development Plans show development intentions and proposals for works by the Commission, as well as possible development by the private sector. They focus attention on the Commission's intentions for development within the broad context of the Policy Plan.

Generally, Development Plans relate to Commission programmes for expenditure and are, therefore, short-term, while Policy Plans have a longer time frame.

Existing Situation, Trends and Forecasts

The following section summarises the existing situation and forecast change for Metropolitan Canberra, together with those trends or issues which bear directly on the formulation of the Policy Plan and Development Plan. The method of analysis is based on the separate treatment of subject areas, such as employment and retail.

Social and Economic Aspects

Employment

- At June 1983, the labourforce of the ACT was approximately 115 700 of which 7 700 were unemployed. In addition, approximately 6 000 jobs were located in Queanbeyan.
- In the next twenty years the Canberra/Queanbeyan workforce is projected to increase to about 186 000.
- The distribution of employment is a key planning variable influencing the length and cost of the journey to work; the level of noise, air and water pollution; and the level of investment required to implement the plan.

Population

- Between 1971 and 1975, the average annual population increase in the ACT was 11 000, of which about three-quarters was a result of net migration. Between 1976 and 1982, net migration averaged only 1 000 per annum, or 22 per cent of the growth of the period.
- At June 1983, the population of Canberra was estimated at 234 900, and that of Queanbeyan at 20 150.
- At June 1983, the population of Inner Canberra had fallen to below 60 000 from a peak population of 83 000 in 1967. The population of Woden-Weston Creek had begun to decline, while Belconnen's population was stable at about 77 000. Tuggeranong's population had grown to 38 450 in June 1983 since its settlement commenced in 1973.
- Canberra's population is projected to increase to 292 000 by 1991, and to 378 000 in twenty years time.
- The population over 60 years of age is projected to increase from 15 100 in 1981 to about 37 000 by the turn of the century.
- The growth of the population, its location and characteristics produce demands for schools, shops, employment, land, housing, hospitals and other community facilities. Its distribution has a bearing on the level of investment required, the environment and the relative accessibility of the population to commercial, community and recreational facilities.

Land and Housing

- At June 1983, there were an estimated 63 900 occupied single residential dwellings and 11 200 occupied medium-density dwellings in Canberra.
- Annual occupations of single residential dwellings have fallen from 3 100 in 1976-77 to 1 570 in 1982-83. Medium-density dwelling occupations have varied from between 500 and 750 per annum over this period.
- Land for development in the existing towns and in North-East Tuggeranong is expected to be largely developed by 1987-88. By this time, land is required for development in another settlement area, with the choice being either Lanyon or Gungahlin. Under the population growth projected in the plan period, there is insufficient time to have serviced land in Gungahlin available in 1987-88. The planning and development pipeline for a new town is six-and-a-half years between initial planning and first settlement.

As a consequence, first land turn-off in Gungahlin is unlikely to occur until 1989-90. Lanyon, as a result of its more advanced stage of planning (Conder, its first suburb, is already gazetted) can be available for settlement in 1987-88. Therefore, as North-East Tuggeranong reaches capacity, the development frontier will move to Lanyon.

Retail

- At September 1982, Canberra had an estimated 369 000 m² of retail floorspace or 1.6 m² per capita according to the Commission's definitions and measurements, although the ABS 1979-80 Retail Census suggested that there was only 1.4 m² per capita.
- The provision varied from 1.8 m² per capita in Inner Canberra (excluding Fyshwick) to 0.23 m² per capita in Tuggeranong.
- There was movement of expenditure between each of the towns in response to the retailing opportunities available. The level of expenditure outflow from Tuggeranong was the most pronounced, with only 23.5 per cent of Tuggeranong residents' retail expenditure occurring in Tuggeranong in 1980.
- Relative to the State Capitals, Canberra's level of floorspace provision per capita in 1980 was not excessive, being less than Melbourne, Adelaide, Perth and Hobart. Sales per square metre were higher than in all Capitals except Sydney.
- It appears that the Canberra population can support retail floorspace of about 1.4 m² per capita in planned centres.
- The level of floorspace provision in Gungahlin and Tuggeranong will be related primarily to the floorspace supportable by the residents of these districts, but will also be subject to the overall metropolitan supply of retail floorspace.
- The distribution of population indicates that Civic is more central than any other centre to the metropolitan area. Civic may be able to capitalise on this accessibility advantage for goods requiring a metropolitan population threshold.

Leisure and Recreation

- Outdoor leisure opportunities in Canberra include those available in neighbourhood and district parks, and rivers, lakes, nature reserves and other components of the National Capital Open Space System. Leisure opportunities are also provided by the surrounding region which includes the NSW South Coast and the Snowy Mountains.
- The rate of daily use of river and lakeside recreation has remained static since 1975 at about 165 visits per 1 000 population. On this basis, in twenty years the daily participation will be about 67 000 people. As recreation pressure increases, development of additional swimming areas may be required to enable the continued use of the lakes for swimming.
- Rising maintenance and management costs of municipal open space have resulted in greater mechanisation, and changes in maintenance standards.
- The Canberra population is served by a wide range of indoor leisure and recreation facilities, including tenpin bowling alleys, community halls, basketball stadiums, the National Exhibition Centre, National Sports Centre, Canberra Theatre Centre, Theatre 3 in Acton, cinemas in Civic and Manuka, and indoor soccer, cricket and riding facilities.
- There has been increasing demand for indoor leisure facilities, often incorporating gymnasiums, swimming pools and squash courts. Each of the towns is served by at least one of these facilities. In Inner Canberra there is the YMCA in Civic Centre and the Deakin Health Spa; there are Lifestyle centres in Woden and

Belconnen; YMCA in Woden; Kippax Sports World in Belconnen and the Erindale Centre in Tuggeranong. The Commission will continue to assist in their provision through the selection of appropriate sites.

- According to the Domestic Tourist Monitor Survey, the estimated number of tourists to the ACT in 1980-81 was 1.9 million. Popular attractions included national works and government-operated activities such as the National Library, High Court, War Memorial, National Gallery and Parliament House.
- Annual tourist numbers could increase by some 600 000 by 1988, and double in twenty years. Accommodation and entertainment services currently provided would need to increase proportionally to cater for the increased needs.
- Tourism provides an opportunity to diversify Canberra's economic base. As the national areas will remain the focus of tourist activity, Civic and adjacent areas are well placed to serve the tourist demand for accommodation, entertainment and recreation.

Transport

Road System

- The car is the dominant form of transport for all purposes except for journeys to and from school. About 75 per cent of trips are made as a car driver or passenger, 7.5 per cent by bus, 15.4 per cent walking or cycling, and 1.5 per cent by taxis or motorcycle. Bus travel accounts for 8.5 per cent of all work trips, and from 15 per cent to 18 per cent of work trips to the office/retail core of each town centre.
- Canberra's hierarchical road strategy of local access streets, distributor roads, arterial roads and parkways has resulted in improved residential amenity and contributed to Canberra's relatively low accident rate - 11 fatalities per 100 000 population compared to the Australian average of 20 fatalities per 100 000 population.
- Congestion is being experienced in Civic Centre on both the primary access roads and the internal distribution system. Growth in Civic employment and retailing will exacerbate problems in the absence of additional road capacity or policies to reduce traffic demand. A computerised traffic signal system is currently being installed to improve traffic flow in Civic. There are currently localised traffic congestion problems at the Woden and Belconnen Town Centres.
- Traffic congestion results in increased fuel consumption, encourages the use of minor roads, reduces residential amenity and causes safety problems. Roads on which there are undesirable traffic volumes include Strickland and Stonehaven Crescents, Kent and Goyder Streets, and Limestone, Macarthur and Wakefield Avenues.

Public Transport

- The public transport system is based on a line-haul and feeder concept. Local bus services or feeders provide a basic transport service between each suburb and the closest town centre. Express buses provide a line-haul service between the centres. A public transport interchange at each of the town centres enables the efficient transfer of passengers.
- The bus network covers 800 route kilometres. Most residents live within 400 m of a bus stop. Annual bus patronage is about 20 million passenger trips.
- Over the past decade the public transport deficit has increased, being \$12.5 million in 1981-82. In 1980 the subsidy per passenger in the ACT was 52 cents. This compared to 50 cents per passenger

in Melbourne, 79 cents in Brisbane, 59 cents in Adelaide, 60 cents in Perth, 46 cents in Hobart and 52 cents in Sydney.

- The future mode split between car and bus transport will be influenced by factors such as the relative cost of each mode, availability of fuel, supply and cost of parking, household income and car availability, and the quality of the public transport system.

Car Parking

- Parking controls have been introduced in Civic Centre and the Woden Town Centre to enable the provision of short-stay parking in convenient locations. Long-stay parking charges will need to be introduced to modify parking demand and to assist in the financing of new facilities.
- A parking structure is proposed for Civic in the next two to three years to relieve parking pressures. As employment grows in Civic further parking structures will be required. Structured parking costs in the order of six times more than surface parking.

Summary

- Transport facilities in Canberra have been planned to complement the City's urban structure and provide a basis for future growth and development. Canberra is serviced by a high-quality parkway and arterial road network which provides for reduced travel times, lower congestion, reduced fuel and operating costs, a reduced accident rate and less air pollution.
- The public transport system, which is based on trunk inter-town services between bus interchanges at town centres and local feeder routes within towns, provides a high-quality and flexible service to meet both off-peak and peak-hour needs.
- Car parking provision at most employment centres is currently adequate to meet demand although Canberra is entering a stage of development where it will not be possible to provide parking at a scale to meet unrestrained demand.

Water Resources and Energy Services

Water Supply

- The three dams on the Cotter River and the Googong Dam on the Queanbeyan River, have a capacity to serve a Canberra Queanbeyan population of 450 000.
- A high proportion of consumption in the ACT is for watering public parks and private gardens. Given the high cost of dam construction and their environmental impact, consideration is being given to techniques for reducing demand and to recycling of waste water.

Sewerage

- The Lower Molonglo Water Quality Control Centre, which treats all of Canberra's sewage, has a capacity of 400 000 population. Augmentation of some existing sewers is necessary as their capacity is exceeded at times.

Stormwater

- Urban runoff is a source of pollutants which may impact on the water quality of local lakes and streams. Progressive provision of stormwater control measures will need to be undertaken in Tuggeranong and Gungahlin and there will be a need to modify some existing infrastructure.

Physical and Environmental Aspects of the City

Ecological Resources

- Population and employment expansion will place additional pressures on the Territory's ecological resources. The Commission's environmental aim is to ensure the future development of the ACT is in harmony with the general environment.

Water Quality

- Parts of Lake Burley Griffin exhibit considerable water quality stress at times due to low flows into the lake and the discharge of Queanbeyan sewage effluent. The impact on waters downstream of the ACT has been virtually eliminated as a result of the high quality of effluent treatment provided by the Lower Molonglo Water Quality Control Centre.

Air Quality

- Emissions from motor vehicles comprise Canberra's major source of air pollution. World Health Organization air quality standards for carbon monoxide and ozone have occasionally been reached or exceeded in Civic Centre. The Commission's planning philosophy of developing town centres to disperse employment and retail opportunities and providing peripheral parkways, has assisted in the prevention of a marked deterioration in Canberra's air quality.

Noise Quality

- The impact of noise in Canberra has also been lessened by the development of the road hierarchy and peripheral parkway system.

Generation of Alternative Plans

Two plan options for a Canberra Queanbeyan population of approximately 400 000 were developed for detailed testing and evaluation. Each option assumed a total retail floorspace of about 585 000 m² and a total employment of 185 600. The population distribution under each plan was the same and included the development of North-East Tuggeranong, Lanyon and Gungahlin.

The Concentrated Plan

In the Concentrated Plan (Figure 3), a significant level of employment and retail floorspace was concentrated in the Central Area and in the Woden and Belconnen Town Centres. The essential features of the Concentrated Plan were:

- employment in the Central Area would grow by about 33 000 to 78 000, with employment in Civic Centre growing by 19 000 to 35 000 and retail space at the centre increasing by almost 50 000 m²

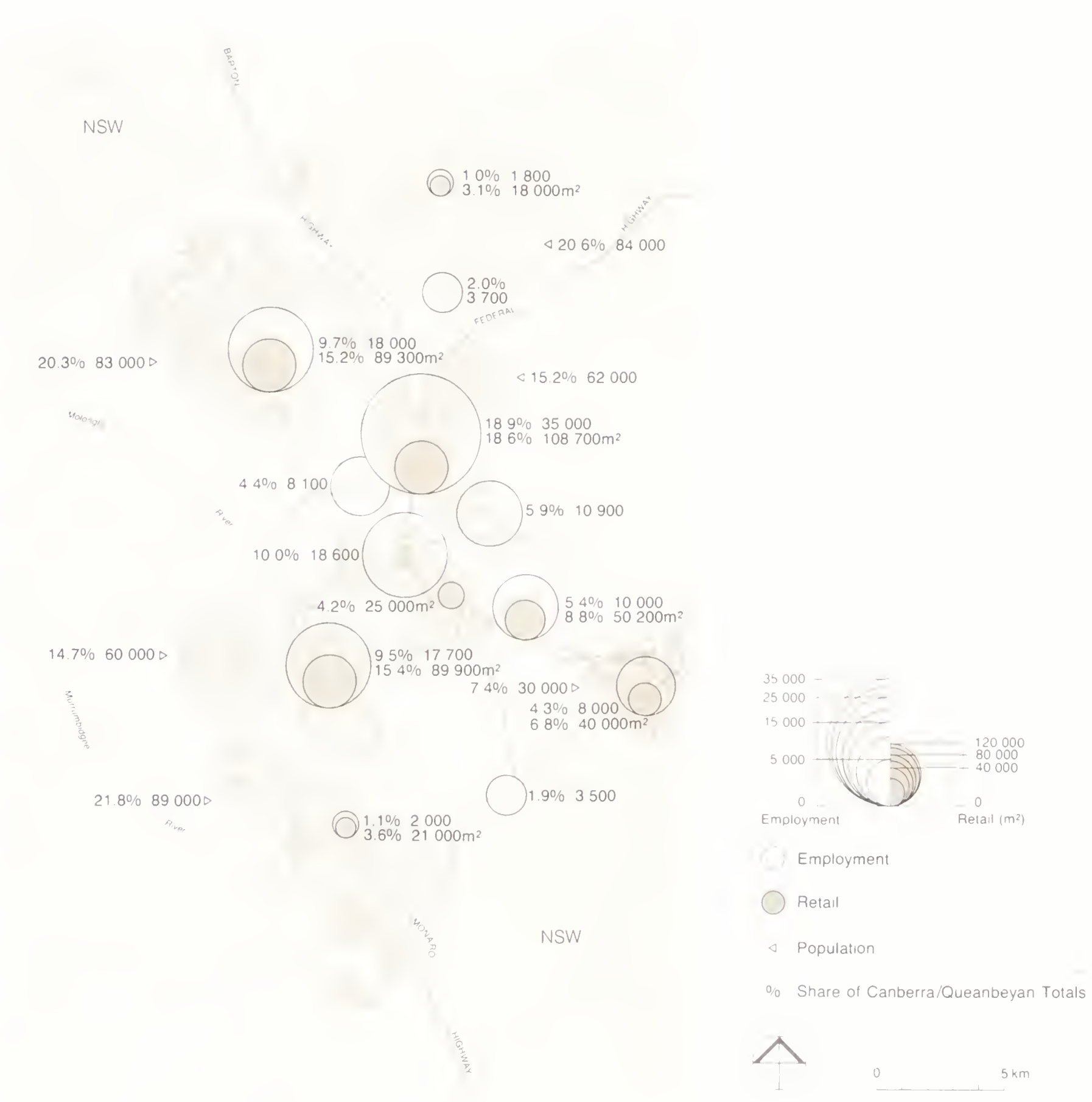


Figure 3 Population, Major Employment and Retail Nodes - Concentrated Plan

- employment at the Woden and Belconnen Town Centres would grow by about 8 000 and 10 000 respectively, with retail floorspace increasing by 22 000 m² in each centre
- Gungahlin and Tuggeranong new towns would not receive significant levels of comparison retailing or employment. These districts would be provided with expanded group centres of 18 000 m² and 21 000 m² respectively.

The Dispersed Plan

The Dispersed Plan (Figure 4) was based upon continuing to disperse employment and retail opportunities along the lines envisaged by the Y-Plan and successfully carried out in Woden and Belconnen. The main features of the Dispersed Plan were:

- town centres with significant retailing and employment would be established in both Tuggeranong and Gungahlin. Tuggeranong Town Centre would include employment of 17 000 and retail floorspace of 50 000 m² , and Gungahlin Town Centre would include 9 000 employment and 47 000 m² of retail floorspace

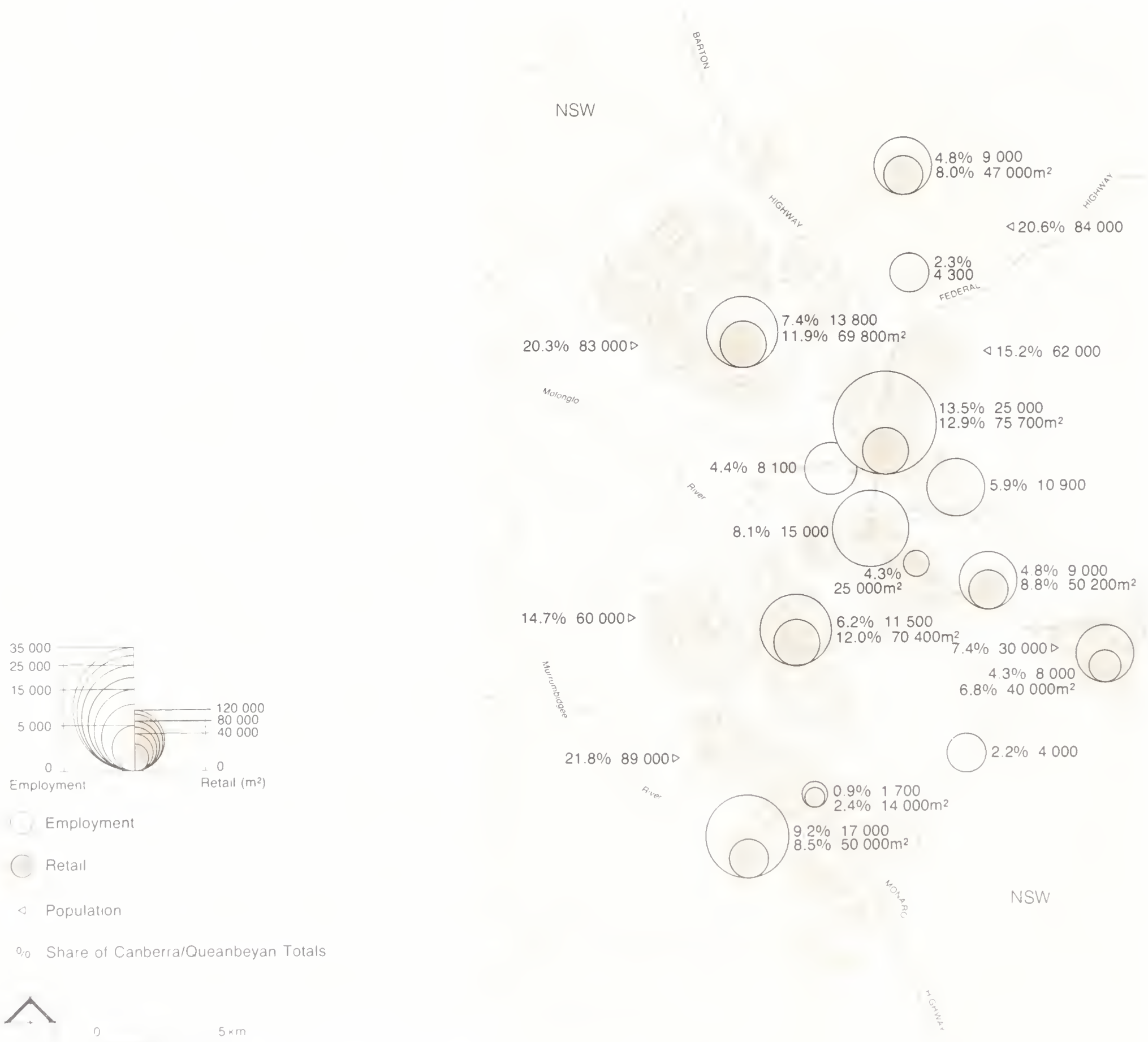


Figure 4 Population, Major Employment and Retail Nodes - Dispersed Plan

- employment in the Central Area would grow by 20 000 to 64 000. Civic's employment would grow by 9 000 to 25 000, and the retail space in the centre would increase by 15 000 m²
- employment at the Woden Town Centre would grow by 2 200 and at Belconnen Town Centre by 5 800. Retail floorspace at each centre would increase by 2 500 m²
- the Central Area would remain dominant in relation to employment and retailing opportunities. The town centres in Belconnen, Woden, Tuggeranong and Gungahlin would primarily serve their respective town catchments.

Evaluation of Alternative Plans

The plan forms were assessed in relation to transport, centres and the Commission's metropolitan aims.

Transport Evaluation

The provision of a transport system is one of the most expensive components of urban infrastructure. Decisions relating to road capacity, the level of parking provision and the level of service and quality of the public transport network, all influence the efficiency and distribution of costs within a city.

Evaluation of the plan forms indicated that the Dispersed Plan, relative to the Concentrated Plan, would confer substantial benefits, including:

- it would have less physical impact, as it would not require the construction of a third crossing of Lake Burley Griffin and as a lower level of road capacity would be required
- lower concentrations of air pollutants, a lower incidence of noise pollution and lower traffic volumes in residential streets would occur
- a more efficient use of the road system. The reverse loading on roads would be higher and there would be fewer congested traffic links
- there would be a 12 per cent saving in user fuel costs
- a saving of at least \$120 million on the investment required for urban arterials and parkways
- fewer structured car parks would be required, producing a saving of \$80 million to \$100 million
- a lower public transport deficit, as peak-hour demand would be lower and the Dispersed Plan would more evenly balance directional flows
- the Dispersed Plan proposes a more equal provision of retailing, employment, and community facilities. In doing so, it would reduce the length and cost of journeys by the residents of all towns, in particular, those of Gungahlin and Tuggeranong.

Centres Evaluation

The level of employment and retail floorspace at Civic Centre and the Woden and Belconnen Town Centres was evaluated in relation to:

- development thresholds, i.e. the availability of vacant land
- transportation thresholds, i.e. the capacities of the arterial road system feeding each centre and of each centre's internal road network
- Canberra's urban structure goals
- the effect on Canberra's retail system.

Development Thresholds

Under the Dispersed Plan, employment at Civic Centre and the Woden and Belconnen Town Centres would increase by 17 000 in total, and under the Concentrated Plan, these centres would grow by 37 000. At their existing development densities these centres could accommodate an additional employment of 10 000 to 14 000. The intensity of development at the centres, particularly Civic Centre and Woden Town Centre, would need to be increased considerably by large-scale redevelopment if the employment proposed in the Concentrated Plan were to be accommodated. It was considered, however, that the employment associated with the Dispersed Plan could be accommodated with only limited redevelopment occurring in Civic Centre and Woden Town Centre.

Transportation Thresholds

Road Network Thresholds

The employment capacity of the centres, based on the capacity of the road network, was evaluated. The results are summarised in Table 1.

Table 1 Employment Capacity

Centre	Existing Road Network	Existing Road Network Plus Doubling of Bus Patronage
Civic Centre	27 000(1)	29 000
Woden Town Centre	13 200	17 000
Belconnen Town Centre	23 000	30 000

(1) Assumes construction of Monash Drive and duplication of Coranderrk Street.

The existing road networks could handle a total additional employment of 30 000 at the three centres, and an extra 43 000 employment if the mode split to the centres doubled, which is considered unlikely.

Civic Centre and the Woden Town Centre were not designed for the levels of employment proposed in the Concentrated Plan. As a consequence, both centres would require modifications to their road networks if the Concentrated Plan were pursued.

The road system in Civic would require two arterial by-pass routes, which could have significant environmental impacts, and major improvements to the distributor road system. Bus-only lanes would be essential as well as an extension of the bus interchange.

In Woden Town Centre, Hindmarsh Drive would need grade separation from Ainsworth Street to Melrose Drive inclusive at a cost of about \$5 million.

Car Parking Thresholds

The Dispersed Plan would require lower investment in car parking structures than the Concentrated Plan (Tables 2 and 3).

Table 2 Number of Structured Car Parking Spaces at 15 Per Cent Mode Split

Centre	Dispersed Plan		Concentrated Plan	
	Spaces	Cost (\$ millions)	Spaces	Cost (\$ millions)
Civic Centre	8 100	50	18 000	110
Woden Town Centre (excluding Woden East)	1 500	10	7 000	40
Belconnen Town Centre	1 500	10	3 000	20
Total	11 100	70	28 000	170

At 15 per cent mode split, equivalent to the current level, the Concentrated Plan would require additional car parking investments of \$100 million compared to the Dispersed Plan. In the Dispersed Plan 8 100 structured car parking spaces would be required in Civic assuming 15 per cent mode split, while in the Concentrated Plan 18 000 structured spaces would be required in Civic. This represents an additional cost of \$60 million.

Table 3 Number of Structured Car Parking Spaces at 100 Plus Centres
Mode Split

Centre	Dispersed Plan		Concentrated Plan	
	Spaces	Cost (\$ millions)	Spaces	Cost (\$ millions)
Civic Centre	3 200	20	11 000	70
Woden Town Centre (excluding Woden East)	-	-	3 000	20
Belconnen Town Centre	-	-	1 500	10
Total	3 200	20	15 500	100

Urban Structure

A major strength of Canberra’s urban structure is its system of centres. Combined with the transport network they produce a relatively efficient and congestion free city despite its apparent widespread character. Other cities such as Perth and Brisbane have proposed subsidiary centres in their plans for future development in order to achieve some of the benefits Canberra already experiences.

- The continuation of the system of town centres would:
- reduce construction costs for new metropolitan roads and structured car parks
 - reduce travel and car operating costs and air quality problems in Civic and the Central Area
 - limit the increase of the public transport deficit
 - provide opportunities for people to live and work in the same town
 - provide opportunities to achieve a more equal distribution of shopping, community and other facilities and services across the City.

The evaluation confirmed that employment levels similar to those in the Dispersed Plan, which limits the growth of existing centres in order to enable new centres to be established, would ensure the continued attainment of these benefits in the future.

Retail Evaluation

The Dispersed Plan, by proposing retail centres in Tuggeranong and Gungahlin at a level comparable to the other towns, would improve the accessibility of the residents of these districts to retailing opportunities.

The provision of a Tuggeranong Town Centre would reduce pressures on the Woden Town Centre to expand, thereby assisting Civic’s function as the main metropolitan centre.

Aims Achievement Evaluation

Each Plan was evaluated in relation to how it met the Commission’s metropolitan aims of image, social and economic need, environment, choice, conservation, movement, flexibility and implementation.

This evaluation drew in part from the transport and centres assessments and from qualitative assessments of issues relating to the social, economic and environmental impacts of the Plans. The evaluation was aimed as a broad overview of the impacts of the alternative Plans in order to ensure that adequate consideration had been given to the other systems of the City.

On balance, the evaluation indicated that the Dispersed Plan would perform better than the Concentrated Plan in relation to transport and

centres issues and, overall, also perform better in achieving the stated aims for the future Canberra. This performance is briefly described as follows:

Image

The Concentrated Plan would place greater transport pressure on the Central Area due to the greater concentration of employment. It also has the potential to generate increased traffic intrusion into residential streets in Reid, Braddon, Turner and Barton because of increased parking demands and to cause a greater deterioration of air quality in the Central Area. The Dispersed Plan is therefore favoured, as it would be more likely to enhance Canberra's image as the National Capital.

Social and Economic Need

Economic implications relate to such factors as the level of investment required to implement and operate the Plan for the City. Social implications include consideration of such issues as the lengths and costs of journeys to work, school, shopping, recreation and community facilities, and housing choice and cost. The Dispersed Plan would require less total infrastructure for transport facilities, offers the potential for a more efficient and less costly public transport system, and would result in lower average private travel costs.

Environment

Because development in Gungahlin and south-eastern Tuggeranong is common to both the Concentrated and Dispersed Plans, there are no major differences between the options, in terms of the impact on ecological resources, open space and recreation areas, or the viability of rural land use. The issues of greatest concern with respect to ecological resources involve the impacts of peripheral parkways and arterial roads, which will need to be given due consideration in planning, design and construction.

Both Plans would significantly increase traffic noise in the inner city suburbs of Ainslie, Reid and Braddon, particularly along Limestone Avenue. On a comparative basis, the Concentrated Plan would have a marginally greater impact, notably in the Yarralumla area and in North Canberra along Antill Street, Wakefield Avenue and Barry Drive.

A water resources evaluation indicated that there was no significant difference between the two plan options with respect to infrastructure costs in water use implications.

On balance, the Dispersed Plan is favoured, as it would have less impact on the environment.

Choice

Because of the greater dispersal of employment opportunities and retail floorspace in association with community facilities to the new town areas, the Dispersed Plan is seen as offering the greatest potential choice for living, working and shopping.

Movement

The Dispersed Plan would provide the potential for shorter journeys for Tuggeranong and Gungahlin residents and considerably lower average metropolitan travel times for journeys to work, and shopping activities. It would be less costly to implement in terms of road infrastructure and car parking provision, offers the potential for a more efficient and less costly public transport system and would result in lower average private travel costs. The Concentrated Plan would also require a third crossing of Lake Burley Griffin and a new distributor road in Civic Centre for the movement system in the Central Area to function.

Conservation

Both plan options would have the same level of impact on the rural areas and natural systems of the ACT such as the lakes, rivers and streams. In the urban areas, because of the greater concentration of employment opportunities and retail floorspace in the Central Area and in the Woden and Belconnen Town Centres, the Concentrated Plan would have a significantly greater impact on the existing built environment adjacent to these areas, and on Inner Canberra in particular. The Dispersed Plan is therefore favoured.

Flexibility

The provision of town centres in the new towns of Tuggeranong and Gungahlin and the greater dispersal of employment opportunities and retail floorspace in the Dispersed Plan are seen as offering a more flexible framework for allowing future changes and alternative phasing possibilities to occur than the Concentrated Plan.

Implementation

The Dispersed Plan would require a lower level of government investment to implement than would the Concentrated Plan. However, the Dispersed Plan would require considerable support and assistance from the Department of Administrative Services and other government departments in achieving the decentralisation of offices to Tuggeranong and Gungahlin. The private sector would also need to be supportive in making new investments in these areas.

While a high level of employment dispersal would be beneficial to the functioning of the City as shown by the evaluation of alternatives and would lead to a more cost efficient programme of development, it would be difficult to achieve because it involves the establishment of two new town centres. The relocation of departments and the establishment of private sector offices in a new area can be a difficult and slow process.

The Preferred Plan

Since the testing was undertaken, the Commission has reviewed its planning for Tuggeranong and 4 000m² of retail floorspace is now considered the appropriate size of the Erindale Centre.

The reduction in the size of the Erindale Centre will increase the viability of a retail release at the Tuggeranong Town Centre and allow major comparison shopping opportunities to be consolidated at the one centre, and to be co-located with offices, service trades and other community facilities.

The reduction in the size of Erindale Centre from 14 000m² to 4 000m² of retail floorspace and its employment from 1 700 to 700 will have minimal impact on the results of the testing that was undertaken. Changes of this magnitude are not significant in terms of trip generation on the metropolitan road network.

The evaluation of the Plans clearly shows the benefits of employment dispersal, although the ability of the Commission to attain the benefits of the Dispersed Plan will depend on the co-operation of government authorities, the private sector and community groups.

Having regard to the level of dispersal the Commission was able to achieve between 1968 and 1983 at the Woden and Belconnen Town Centres, the nature of office growth, and the other activities which have been located at town centres, the likely range of employment located at major nodes at the end of the plan period could be as shown in Table 4.

Table 4 Planned Employment Levels at Major Nodes

Civic Centre	25 000 - 27 000
Parkes/Barton	15 000 - 18 000
Woden Town Centre	11 000 - 13 000
Belconnen Town Centre	13 000 - 15 000
Tuggeranong Town Centre	12 000 - 17 000
Gungahlin Town Centre	7 000 - 12 000

The Commission will endeavour to achieve a high level of employment dispersal to the new towns, in order to improve the functioning of the City, to reduce traffic congestion and to ensure that all residents are within a reasonable distance of an appropriate range of facilities.

Policy Plan

The policies of the Plan are dealt with in Chapter 6 in two parts. The first relates to the policy with respect to the urban structure of the City, and the second to the significant elements of urban structure namely:

- National Works
- Employment
- Offices
- Industry
- Population, Land and Housing
- Retail
- Transport
- National Capital Open Space System
- Recreation and Tourism
- Community Facilities
- Urban Environment
- Rural and Non-Urban Areas
- Public Utilities

The Policies should be read in conjunction with the Policy Plan (Figures 5 and 6) in order to gain a fuller appreciation of the proposed overall urban structure of the City.

On the basis of the evaluation carried out and after consideration of the public submissions on the 1980 *Metropolitan Issues-Public Discussion Paper*, the Commission's preferred metropolitan strategy is that which retains the basic urban structure principles of the Y-Plan.

The strategy for urban growth is based on the development of new towns with town centres, combined with consolidation and redevelopment. The features of the strategy are as follows:

- The Central Area will remain the dominant metropolitan employment centre, but the existing policy of decentralising employment opportunities to the new towns will be continued through the dispersal of government offices to town centres in each of the towns.
- Civic Centre will be encouraged to develop as the most specialised retail centre serving both the metropolitan market and special markets such as tourism. Decentralisation of retail floorspace will be continued and will be related to consumer needs, retail economics, transport accessibility and equity considerations.
- Tuggeranong and Gungahlin will both be provided with town centres to service many of the retail, community and recreational needs of the town populations. The eventual size of the Tuggeranong Town Centre is intended to be between 12 000 and 17 000 employment and between 40 000 m² and 50 000 m² of retail floorspace.
- Tuggeranong, that is, the existing planned development east of the Murrumbidgee including Lanyon, will expand to the order of 85 000-90 000.
- While the main suburban development frontier will be in Tuggeranong and Gungahlin, the existing urban area will be consolidated by development of suburbs such as Florey, McKellar, Stirling, Isaacs and O'Malley. Throughout the period of urban expansion in Tuggeranong and Gungahlin, redevelopment of the older parts of Canberra will be increasing.
- The hierarchical system of roads developed in the existing new towns of Canberra and comprising parkways, arterials, sub-arterials, and distributor, collector and access roads, will be continued in the future development of the City and existing road

patterns in other parts of Canberra will be improved to reflect this system where practicable. Traffic congestion will not be promoted as a method of traffic management or to encourage the use of alternative transport modes. The parkway and arterial system will be improved and extended to meet movement demands as they arise.

- The metropolitan road system will need to be extended during the plan period by the following major elements:
 - a) the first stage of the Eastern Parkway will be required to service traffic demands generated by Tuggeranong residents by the time Tuggeranong's population reaches approximately 55 000-60 000
 - b) the existing parkways, Tuggeranong Parkway and Parkes Way, will be progressively upgraded as traffic demands warrant. The further development of Glenloch Interchange will be undertaken in conjunction with these works
 - c) Monash Drive and John Dedman Parkway will be required to service traffic resulting from population settlement in Gungahlin
 - d) other major roads, including Erindale Drive, William Slim Drive, Caswell Drive, Bindubi Street, Flemington Road, Morshead Drive, Fairbairn Avenue and Athllon Drive will be upgraded to provide necessary access and to improve the efficiency of the metropolitan road system.
- Routes for a segregated form of public transport to serve the major movement corridors will continue to be investigated.
- Industrial land will continue to be developed in Fyshwick, Hume and Mitchell. The Canberra Technology Park is reserved for development of high technology industries.
- Tourist facilities will be directed, where possible, into Civic Centre or the Special Tourist Commercial Area at North Watson, consolidating the existing tourist-oriented facilities in these areas.
- The National Capital Open Space System will be progressively developed to accommodate the diverse demands made upon it by Canberra residents and visitors.

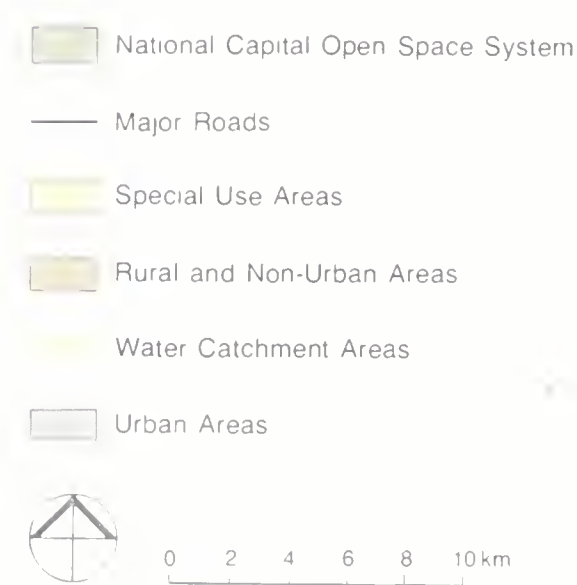
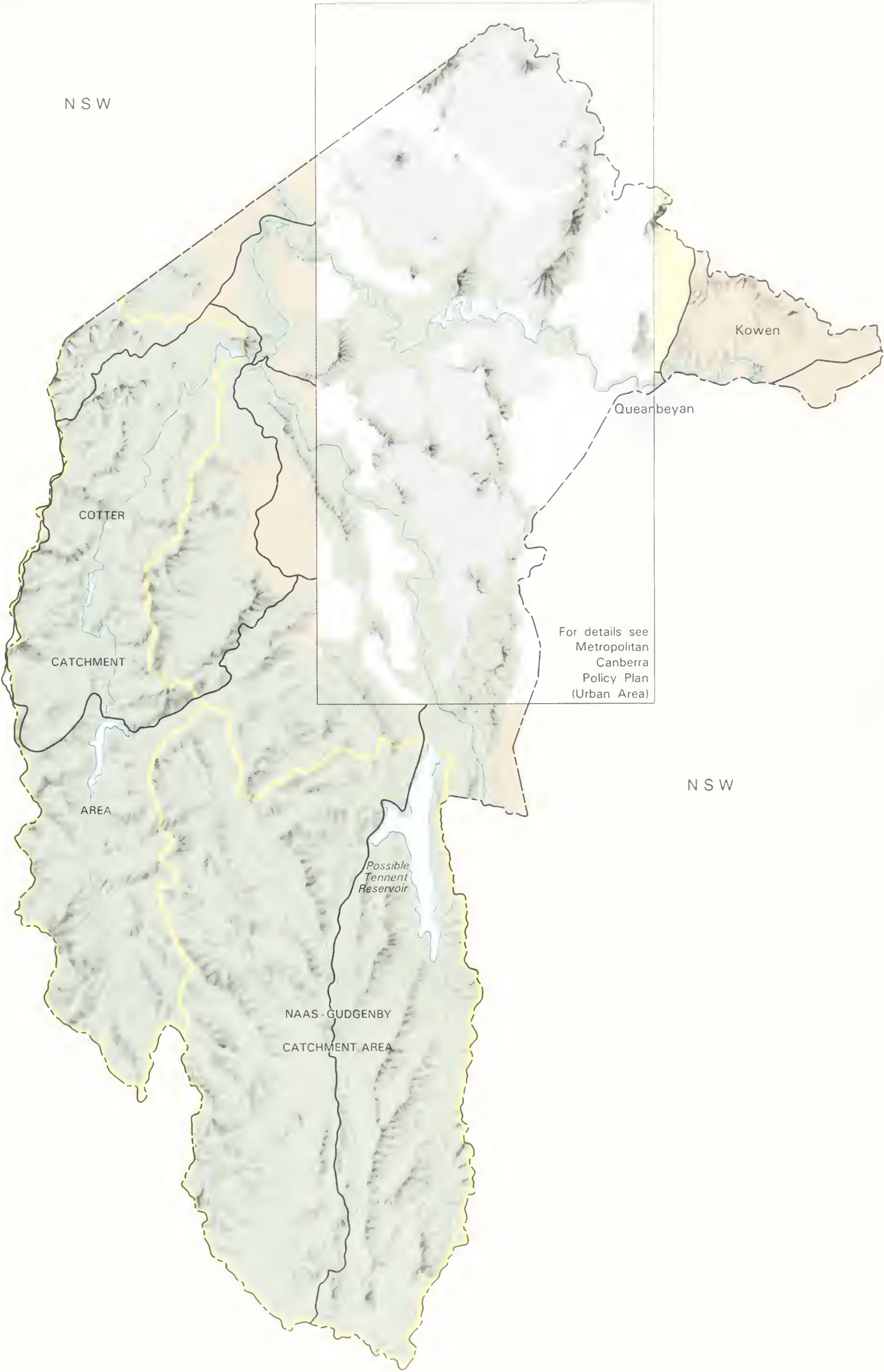


Figure 5 Metropolitan Canberra Policy Plan (ACT)



Principles of Urban Structure

The principal concepts of the Y-Plan which have been confirmed as those to guide metropolitan growth and development are as follows:

- The role of the City as the National Capital remains paramount. The National Capital role demands that national functions are located in a prominent position where they may operate effectively and efficiently. The National Capital role also demands that high environmental and aesthetic standards are applied, particularly in the Areas of Special National Concern.
- The metropolitan growth of Canberra is based on the development of separate urban districts or towns, in a linear arrangement in the form of a 'Y'. Each town is intended to be relatively self-contained and provide for most of the needs of its residents including employment, retail, community facilities, leisure and recreation. Each town is separated from adjacent towns by hills, ridges and other major open spaces.
- The hierarchy of centres will be maintained, with each town having a centre acting as a focal point for higher order retail functions, commercial services, offices and community facilities. Civic Centre is intended to be the highest order commercial, entertainment and tourist centre in Canberra. It will also accommodate the majority of specialised functions and continue to develop as the Central Business District and administrative centre of Metropolitan Canberra.
- Large volume vehicular traffic is carried on a peripheral parkway system, reducing the amount of traffic on the internal systems of the towns. A public transport right-of-way will be developed linking the town centres on an internal spine.
- Industrial estates will continue to be located on the edge of the urban areas in locations which conveniently serve the workforce of the towns and have good accessibility for long-distance freight movements.
- The hills and ridges within and around the urban areas of Canberra will be kept largely free of urban development both to act as a backdrop and setting for the City and also to provide a means of separating and defining the towns. Special use areas and rural and non-urban areas also form part of the buffer zone between the towns and a land bank for future land use and activity needs associated with the growth of the National Capital.

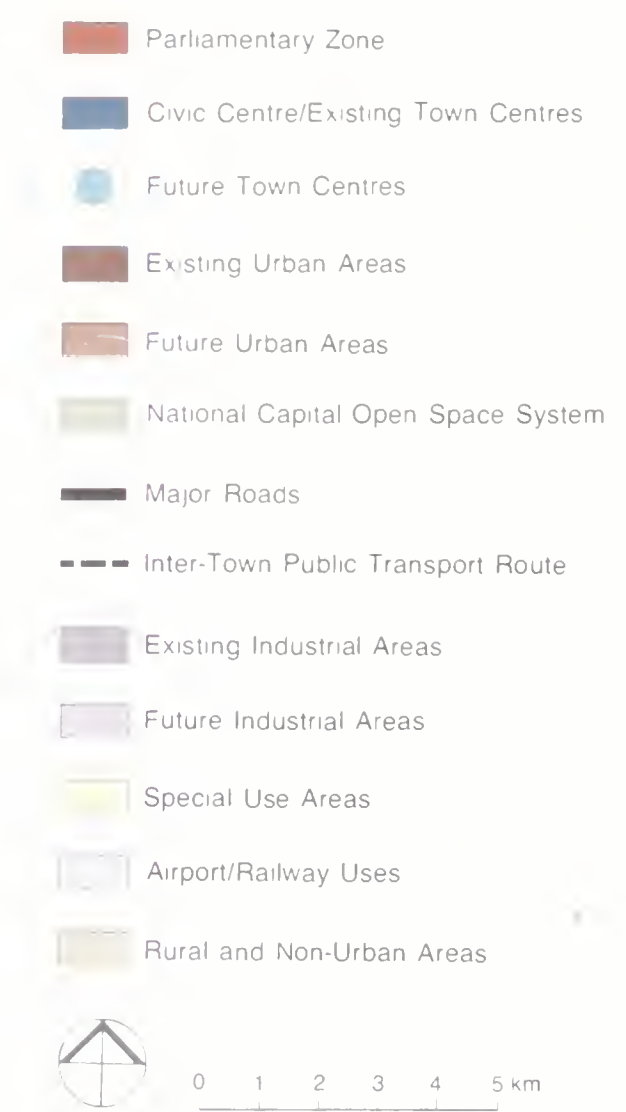
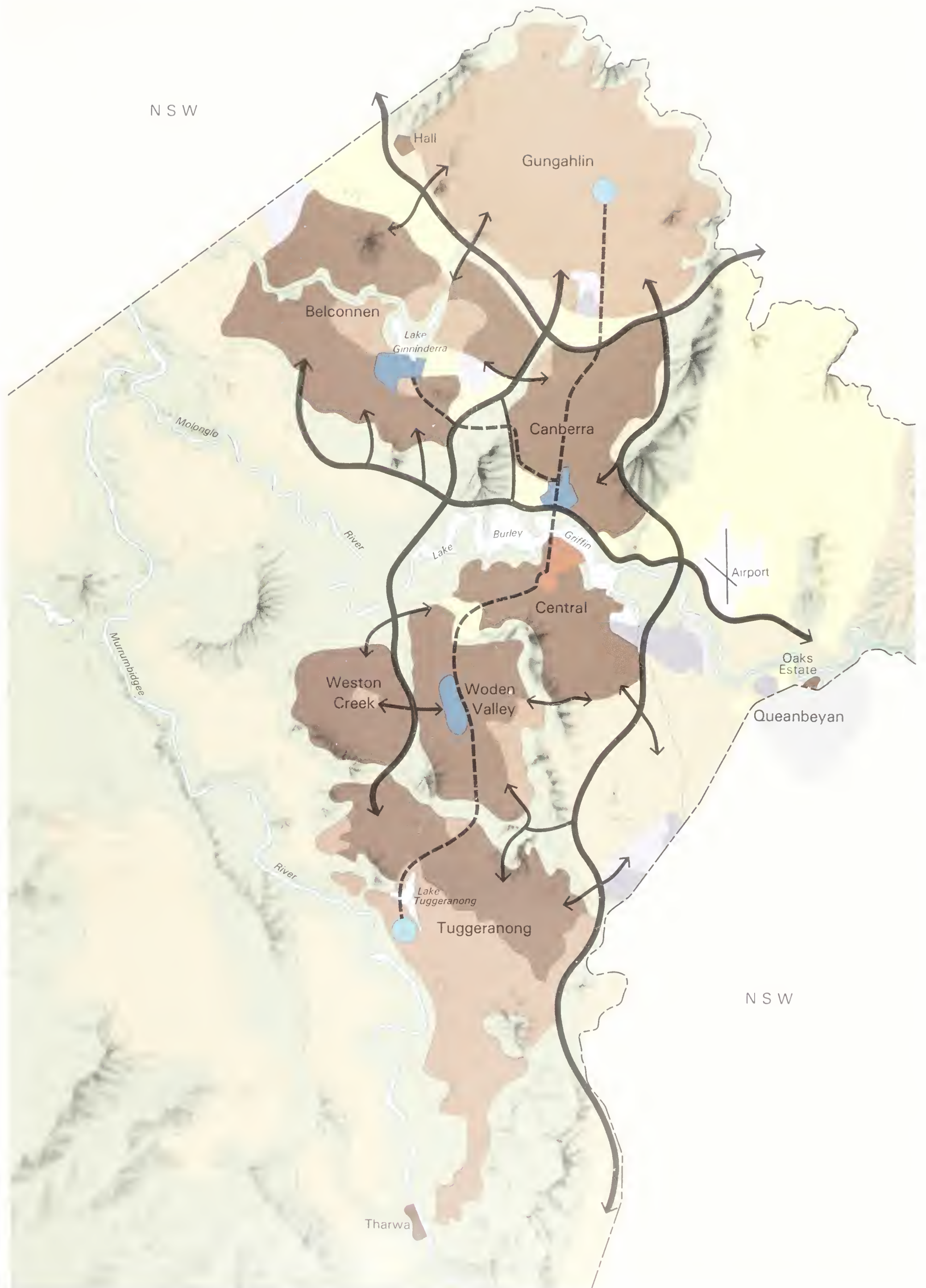


Figure 6 Metropolitan Canberra Policy Plan (Urban Area)



Development Plan

The purpose of the Development Plan is to indicate those development proposals which should be implemented to meet needs arising from population growth or change. The development proposals indicate the main public works that will need to be carried out by the Commission and other public authorities, as well as indicating development opportunities for the private sector, particularly in terms of new housing, offices and retail facilities. The ability to implement the public works will be subject to adequacy of continuing annual appropriations from the Budget.

The Metropolitan Development Plan has been prepared to:

- identify the Commission's intentions for major development works
- inform other public authorities and the private sector of Canberra's expected growth and development over the next twenty years or so
- inform the public of proposed development works
- highlight the range, type and location of development opportunities likely to arise for private enterprise during the plan period.

The Development Plan translates the needs forecasts (outlined in Chapter 4 in terms of housing units, retail floorspace, etc.) into spatial and programme terms.

In implementing the Development Plan the Commission will give priority to:

- consolidating development in the existing towns and promoting the orderly expansion of the City
- encouraging the development of Civic Centre as Canberra's metropolitan centre (Central Business District)
- providing activity centres in the newly developing areas to meet the needs of the local community
- providing adequate traffic access to employment and service centres as Canberra's population grows
- continuing the development of the National Capital Open Space System
- minimising undesirable impacts on the environment, enhancing and protecting the desirable qualities of the existing environment and ensuring that projects, when approved, contain adequate environmental safeguards.

The Development Plan provides the basis for two related streams of action. For its part, the Commission will seek programme status and funding for public works. For the private sector, specific development opportunities will need to be identified, through consultations between the Commission and industry and in conjunction with the promotional activities of the Canberra Development Board. Where possible, projects which should or could be carried out by private enterprise are identified in the Development Plan.

The development proposals cover the whole of the ACT, and because of the different amounts of detail to be illustrated the Development Plan has been prepared in two parts:

- Metropolitan Canberra Development Plan (ACT), dealing with the rural areas (Figure 7)
- Metropolitan Canberra Development Plan (Urban Area), dealing with the town areas (Figure 8).

- 1 Progressive Development of the National Capital Open Space System - the National Capital Open Space System will be progressively developed to protect the river systems, maintain visual quality, provide recreational opportunities, maintain ecological diversity and ensure the ecological stability of urban lands.
- 2 Investigation of Pine Plantations - economic, planning and landscape studies will be undertaken to determine the selective replacement of pine plantations by native species.
- 3 Protection of Water Uses - water quality in lakes and streams will be protected to ensure their designated uses which may include water supply and recreation uses.
- 4 Augmentation of Water Supply - the limits on water resources in the ACT require the protection of possible future sources of supply such as the Naas-Gudgenby Catchment, the restriction of allocation of water to the sub-region and a programme to reduce water consumption.
- 5 Federal Highway Duplication and Upgrading - improvement works will be undertaken to tie in with associated works in New South Wales.
- 6 Reconstruction of Monaro Highway - the road is being progressively upgraded to facilitate movement to and from the Snowy Mountains.
- 7 Upgrading of Cotter Road - the road will be upgraded to improve safety and provide overtaking opportunities.
- 8 West Belconnen-Uriarra Road Connection - a road connecting Stockdill Drive with Uriarra Road will improve access for Belconnen residents to Murrumbidgee and Cotter River recreation areas.
- 9 Brindabella Road-Mt Franklin Road Upgrading, Mt Franklin Road-Corin Road Connection - these works will complete a tourist route from Cotter to Tharwa via the Brindabella Road, Picadilly Circus, Mt Franklin and Corin Dam.
- 10 Boboyan Road Upgrading - work will continue to upgrade and seal the road to the ACT border.
- 11 Relocation of Naas Road - if the Naas-Gudgenby Catchment is required for water supply and the Tennent Reservoir is constructed, the northern part of Naas Road will need to be relocated higher up the slopes of Mount Tennent.

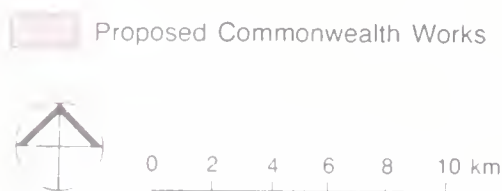
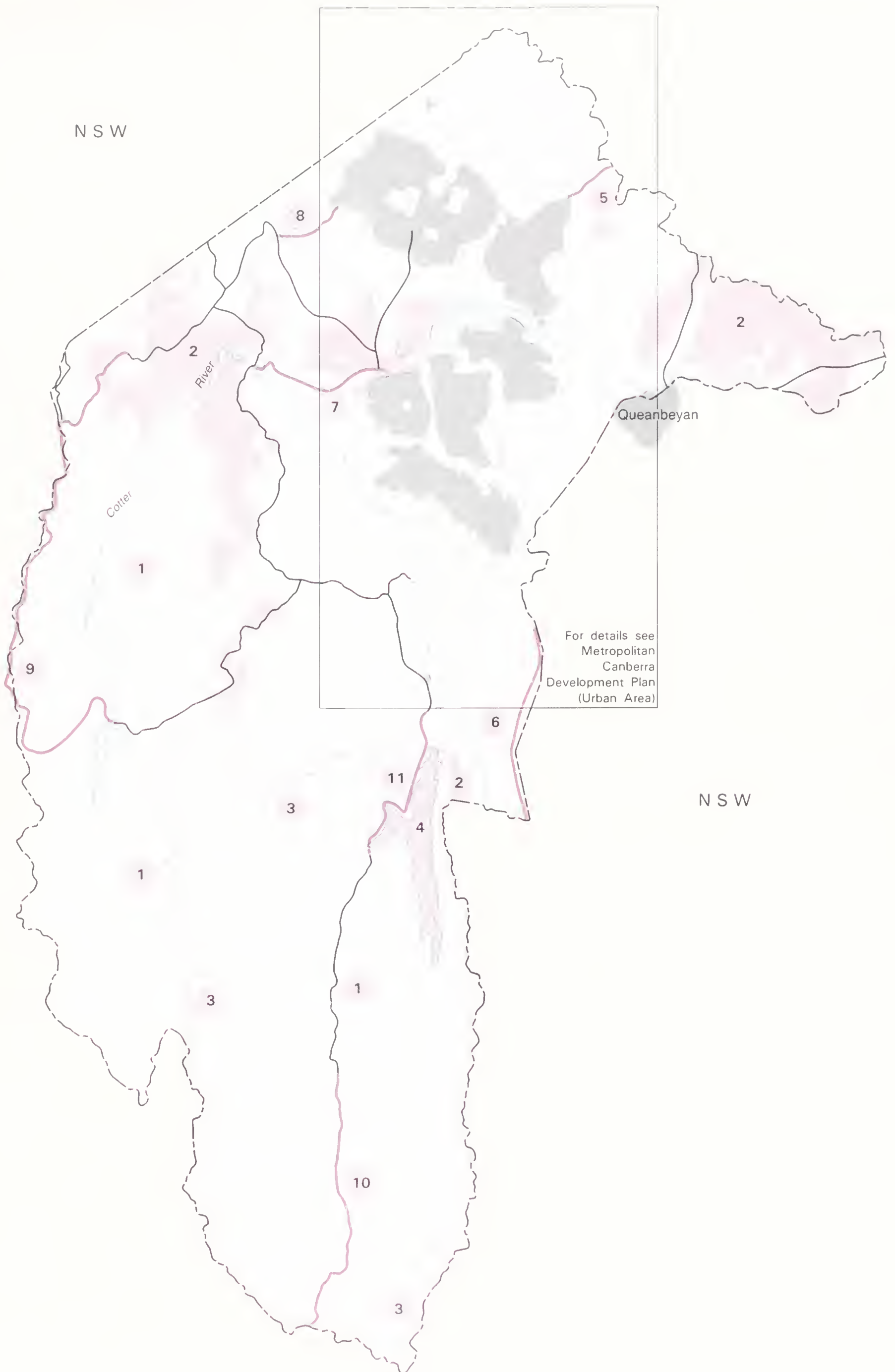


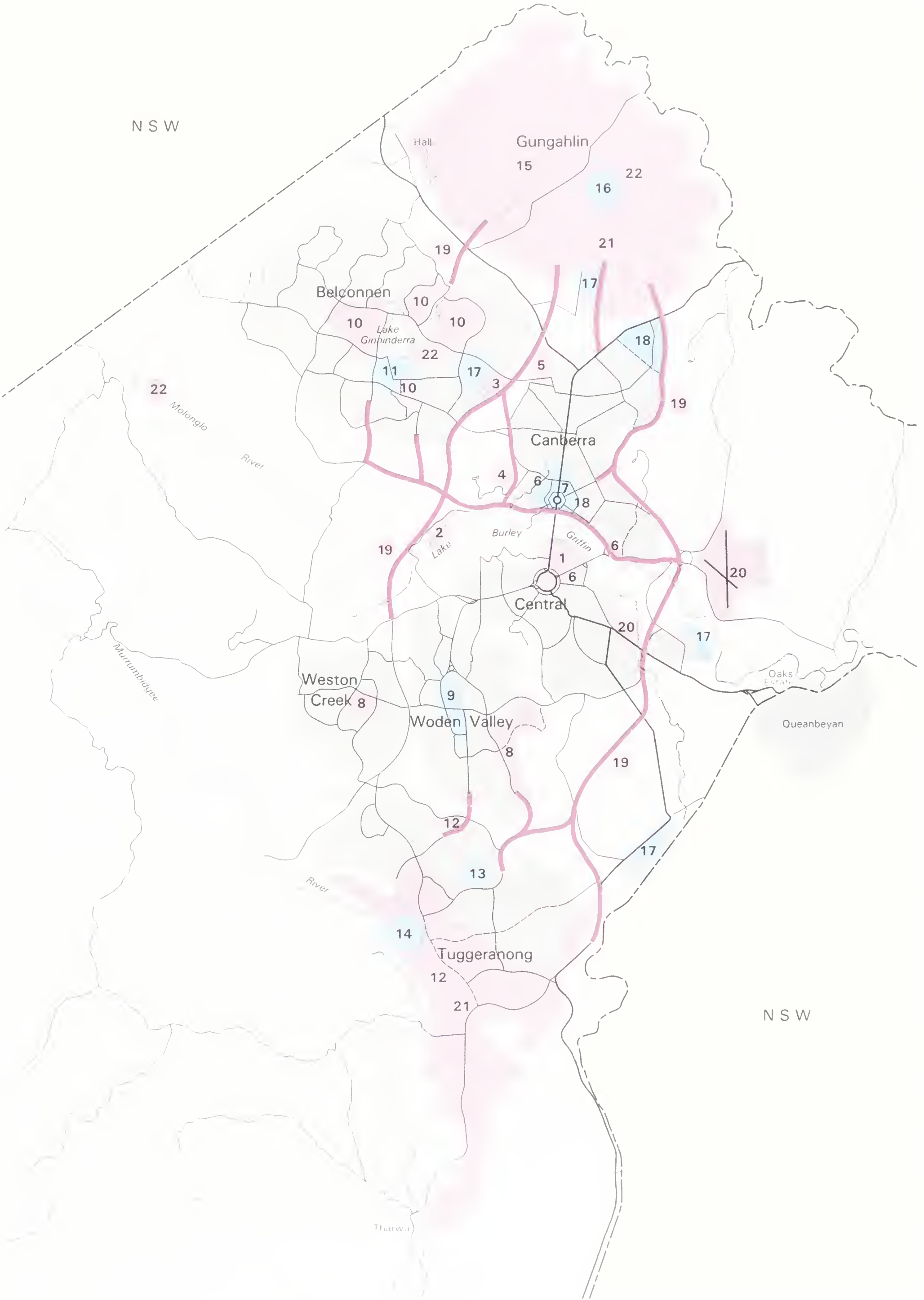
Figure 7 Metropolitan Canberra Development Plan (ACT)



- 1 Parliamentary Zone Development - works will be undertaken to meet the needs of Parliament, national institutions, tourism and public administration.
- 2 Museum of Australia Development - development of Museum at Yarramundi Reach, road access from Lady Denman Drive and complementary works such as car parking and landscaping.
- 3 Development of the National Sports Centre - progressive development as a sport and recreation venue and training facility.
- 4 Development of the National Botanic Gardens - further development including a Visitor Information Centre to enhance its landscape and visitor facilities.
- 5 Inner Canberra Land Settlement and Urban Consolidation - development of North Lyneham, further redevelopment of Kingston.
- 6 Central Area Employment Expansion - Employment expansion of between 19 450 and 24 450 of which between 17 650 and 22 650 will be in Civic, Parkes/Barton and Russell/Campbell Park
- 7 Civic Centre Employment Expansion and Retail Development - Civic Centre employment will grow by between 9 000 and 11 000 and its retail floorspace in the order of 15 000m².
- 8 Woden-Weston Creek Land Settlement - development will be consolidated by the development of Isaacs, Stirling and East O'Malley and vacant medium-density sites.
- 9 Woden Town Centre Employment Expansion and Retail Development - employment will grow to between 11 000 and 13 000, and its retail floorspace by up to 2 500m².
- 10 Belconnen Land Settlement - development will be consolidated by the development of vacant residential land including McKellar, Florey and the Belconnen Naval Station.
- 11 Belconnen Town Centre Employment Expansion and Retail Development - employment will grow to between 8 000 and 13 000, and retail floorspace by up to 2 500m²
- 12 Tuggeranong Land Settlement - the development of remainder of North-East Tuggeranong, the Town Centre and Lanyon.
- 13 Erindale Centre Retail Development - a 4 000m² retail centre will be open by the time Tuggeranong's population reaches 50 000.
- 14 Tuggeranong Town Centre Development - the town centre development will commence within 2 years and will eventually have between 12 000 and 17 000 employment and between 40 000-50 000m² of retail floorspace.
- 15 Gungahlin Land Settlement - settlement will commence in 1989-90 and the town will grow to an eventual population of 84 000.
- 16 Gungahlin Town Centre Development - the centre will commence as a 5 000m² group centre when the town's population is 20 000 and will eventually have employment of 7 000-12 000 and 47 000m² retail floorspace
- 17 Industrial Development - Fyshwick, Mitchell and Hume and the Canberra Technology Park will be developed to cater for likely demands over the next two decades
- 18 Development of Special Tourist Commercial Facilities - tourist facilities will be directed where possible to Civic and North Watson
- 19 Metropolitan Roads Upgrading or Development - the road network will be expanded to cater for expected population and employment growth
- 20 Upgrading of Airport and Railway Facilities - these facilities will be upgraded to cater for growth in tourist, business and government traffic
- 21 Development of Major Electricity Network - the network will be expanded to cater for expected population and employment growth
- 22 Water Resources Infrastructure - the water, sewerage and storm-water networks will be expanded to cater for the expected population and employment growth.



Figure 8 Metropolitan Canberra Development Plan (Urban Area)



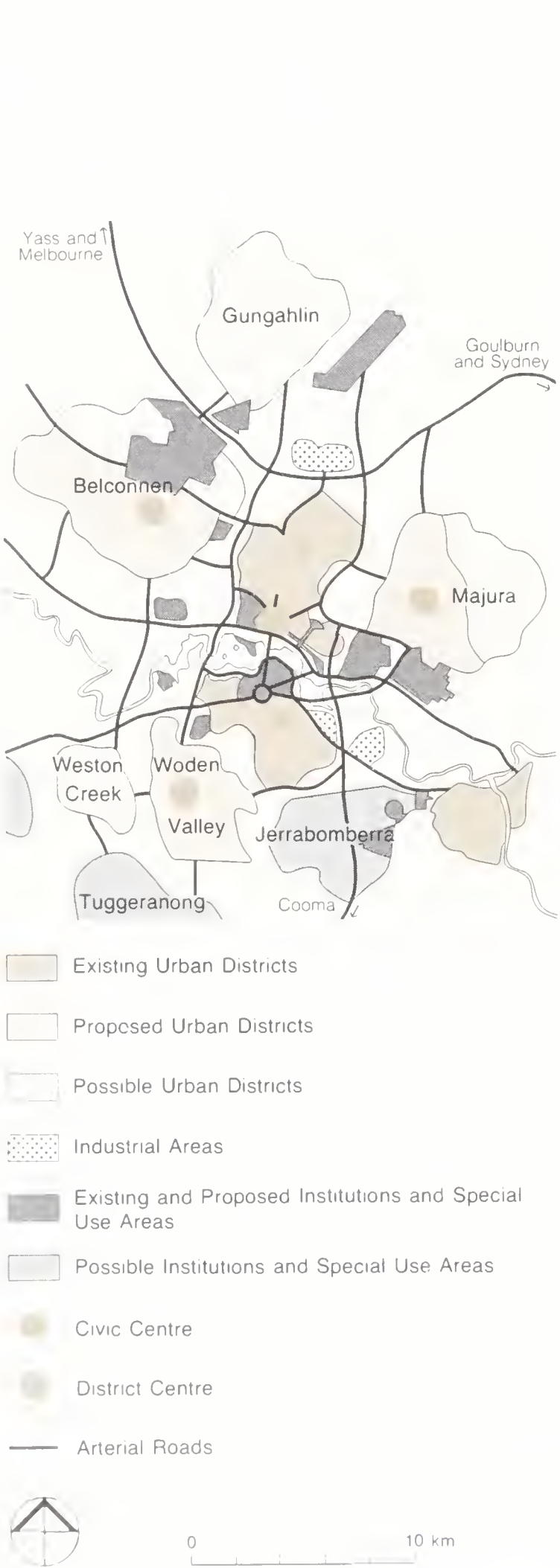


Figure 9 The Outline Plan as Published in *The Future Canberra*

The Y-Plan (1970)

When the Commission was established in 1957, its first task was to establish planning proposals and development programmes to meet the immediate and pressing needs of Canberra in relation to land, housing, offices, schools, shopping, transport, social and community facilities, and essential National Capital components.

Once this task was completed the Commission turned its attentions to the question of the longer-term strategy needed to cope with Canberra’s long-term growth. A strategy was prepared for accom- modating a population of 250 000 by about 1980 and was published in *The Future Canberra* in 1965 as the Outline Plan (Figure 9). In order to ensure that this Plan was a satisfactory and efficient strategy the Commission, in conjunction with Rankine and Hill and De Leuw Cather, undertook the Canberra Area Transportation Study (CATS). The study showed that as the population of Canberra grew beyond 250 000 the Plan would break down and the City would be over- whelmed by transport pressures and traffic congestion. This was because most of the major employment and retail facilities in the Plan were concentrated in Civic and the national area of Parkes and Barton. This meant that the 1965 Plan was of limited effectiveness beyond a population threshold of 250 000.

In recognition of this limitation the Commission in 1966 set about developing objectives for a revised plan for the City that would not only avoid the problems of the 1965 Outline Plan, but would result in a plan that would be economically, socially and environmentally acceptable at population levels well beyond 250 000. The objectives were to:

- allow Canberra to develop as a dignified setting for the Seat of Government
- be amenable to one-stage, short-term development so that the environment desired for a particular area could be achieved at an early stage and stabilised thereafter, without the need for costly reconstruction
- provide variety in the metropolitan area so that reasonable choices of modes of living, working and travelling could be made
- meet future social and technological change by means of a simple but flexible framework for urban development and redevelopment

With these objectives in mind, the Commission in 1966 undertook, in conjunction with Alan M. Vorhees and Associates an American firm of land use and transport consultants, studies to develop a plan which would lead to the establishment of an efficient public transport system and which would reduce potential traffic congestion. The main variables tested related to location and levels of employment; distri- bution and levels of retail floorspace; the metropolitan road network

alternatives including the principal freeway and arterial systems of the future urban areas; and possibilities for a rapid public transport system between future urban districts and major centres.

Four theoretical plan forms catering for an ultimate population of 1 000 000 were formulated as a basis for detailed transport testing. These were a ‘Diamond’ shape, confined to the Australian Capital Territory; a ‘Linear’ shape, extending to the north-west; a ‘Linear’ shape, extending to the north-east; and a ‘Fan’ shaped form, extending to the north-west and north-east (Figure 10).



Figure 10 Theoretical Plan Forms Tested in the 1966 Metropolitan Planning Studies

To test these theoretical notions for growth six optional land-use patterns consisting of different arrangements of towns of 50 000 to 150 000 people were devised. The first four were based on the theoretical plan forms and the remaining two were modifications to the Diamond plan, developed in order to test the effects of increasing residential density and central area employment. The options were then evaluated with respect to retail and market potential, transport efficiency and employment distribution. The conclusions from this work were published in *Tomorrow’s Canberra* in 1970.

The preferred plan became known as the Y-Plan because of the proposed form of development which was a linear pattern in the shape of a ‘Y’.

The essential features of the preferred option (Figure 11) which emerged from this testing can be summarised as follows:

- **The Central Area:** This area, comprised of the national area of Parkes and associated parts of Barton; Civic Centre, the Australian National University, CSIRO, Royal Canberra Hospital and Braddon Service Trades Area; and Defence Headquarters, Russell; was to be planned to accommodate an employment level of 60 000 persons at a metropolitan population of 500 000, and 90 000 persons at a metropolitan population of 1 000 000. These levels

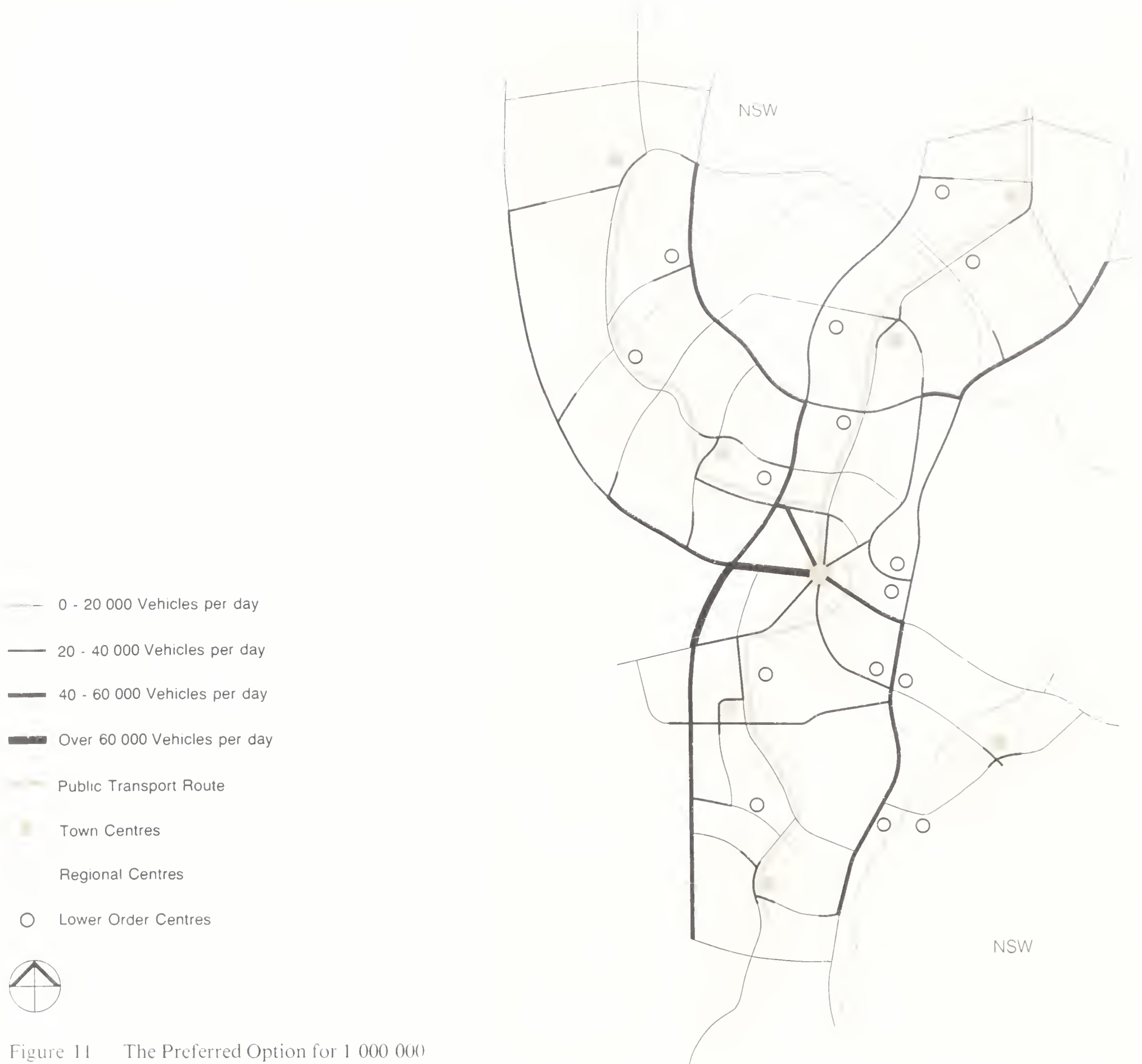


Figure 11 The Preferred Option for 1 000 000 Population

were considered to be the optimum if the area was to function efficiently and not be overwhelmed by traffic congestion.

- **The Regional Structure:** The regional structure was to be formed by directing growth into a series of new towns grouped into three corridors, north, north-west and south-west of the Central Area and forming a 'Y' shape. This would require and in turn support a clearly structured transport system. The growth corridors would occupy natural valley systems and possess a sense of self-containment by virtue of the surrounding hills.
- **Towns and Town Centres:** Each town was intended to have a population of about 100 000-120 000 people. This level was arrived at having regard to the thresholds necessary to support certain social, economic and municipal developments. For example, towns of this size could support a large shopping and employment centre, hospital, Court of Petty Sessions, and police station and would be convenient units in which to operate municipal and social welfare services. In addition such population units could become local government or Federal electorates.

With regard to the distribution and level of retail shopping, comparison goods space of between 110 000 m² and 136 000 m²

was considered to be the range required for Civic Centre. This would be supported by a town centre in each of the new towns which would contain retail space appropriate to the needs of the town population. In order to provide the opportunity for people to work close to where they lived each town centre was to be designed to accommodate between 10 000 and 15 000 employees. Decentralisation of employment and retail opportunities was seen as providing relief from traffic congestion in the Central Area; competition for comparison goods shopping; and more efficient use of the road network system through reverse loading and reduced journeys to work.

- **The Transport System:** The transport system was to comprise an express public transport route connecting the town centres and running through the built-up spine of each town. It would be supported by local feeder bus systems. The notional central express route connected the Belconnen and Gungahlin Town Centres to Civic Centre, Russell, the Woden Town Centre, and the Tuggeranong Town Centre with stops placed not less than one and a half kilometres apart, except within the town centres themselves. The main element of the road network was a system of peripheral parkways situated for the most part outside the built-up areas.
- **Landscaped Open Space:** A landscaped open space system was to be used to reinforce the natural hill and ridge systems in order to define a clear boundary between urban areas and rural areas. Within the town areas landscape treatment was to be used to enhance the localised natural features, provide recreation spaces and provide colour and contrast within the built-up area.

The total population capacity of the Y-Plan, which extended across the ACT NSW border, was up to 1 000 000. From this generalised concept for urban growth an Intermediate Plan at the 500 000 population level was developed as a basis for forward planning for the immediate and mid-term futures (Figure 12).

In formulating an Intermediate Plan to the 500 000 population level the distribution of key activities was guided by two development objectives. The first was to strengthen the Central Area so that it achieved, as soon as possible, the indisputable appearance and function of the main focus of the region. The second was to concentrate development in as few of the towns as necessary to provide a reasonable choice for the future residents and businessmen of the City. It was considered that concentration of growth would permit economies of large-scale construction programmes and provide early attainment of the final built-environment for the occupants of the new towns.

The build-up of the Central Area had also to be controlled to ensure that imbalances in the location of home and work locations during the various stages of the City's development would not produce higher traffic volumes on the inner road network than those forecast for the 1 000 000 population level. Testing indicated that to achieve an acceptable balance between town development and Central Area employment, the Central Area at the 500 000 population level should not exceed 60 000 employees or two-thirds of its ultimate size. This was because the adjacent towns would provide a higher proportion of their employment to the Central Area than would the more distant towns. With regard to the build-up of town populations, the study showed that if the population of a town could be built-up to 40 000-50 000 in the first five years, this would support a first stage of its town centre in terms of retail and employment activity. During the following five-year period, it was intended that the population should continue at a fairly rapid rate to provide firm support for the continued expansion of the town centre (Figure 13). At the growth



Figure 12 The Intermediate Plan for 500 000 Population

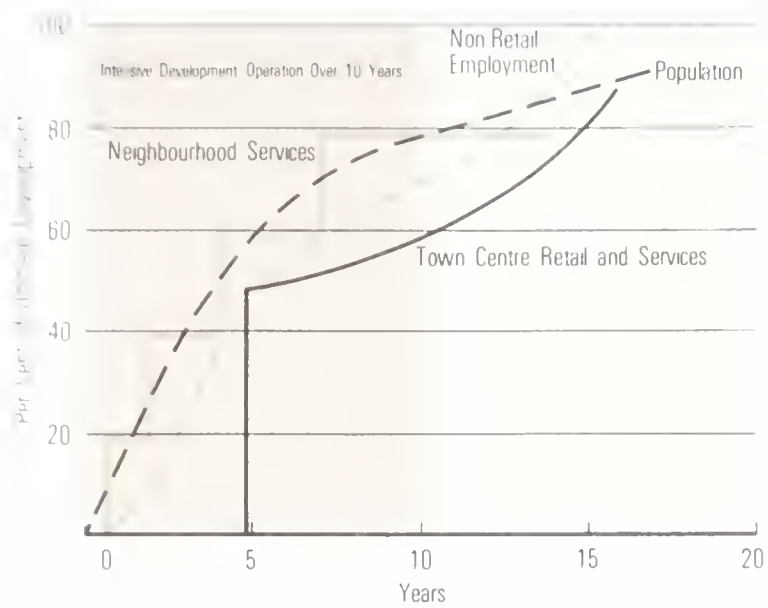


Figure 13 Town Development Strategy for the Intermediate Plan

rates being experienced in 1967, this implied the commencement of a new town approximately every ten years.

The evaluation showed that highway facilities should be programmed in accordance with the needs of both traffic demands and access requirements. The general strategy postulated was to build only the internal or central arterial during the initial development of the town with the extension of the peripheral parkways and arterial feeders giving access to the town centre, being provided after the town had achieved 50 to 70 per cent of its growth.

The principal conclusion derived from the evaluation was that an urban form based on linear corridors containing a series of towns and radiating from the Central Area in the shape of a 'Y' would be the best form for long-term growth of the City. It would facilitate extension of the urban area and would protect the integrity of the Griffin Plan.

Metropolitan Issues Report (1980)

All plans need to be reviewed at regular intervals. In the ten years after the publication of *Tomorrow's Canberra* dramatic changes occurred in many crucial factors the most important of which were population growth rates, car ownership and household size. With this in mind, the Commission in 1980 undertook a review of the Plan's performance to date, and identified the significant existing and emerging metropolitan issues. In April 1980 a 'green paper' was published on metropolitan issues which was the subject of discussions at a seminar attended by members of the Canberra community, the ACT House of Assembly, local parliamentarians, shire councillors, representatives of special interest groups and other authorities concerned with Canberra's future development.

Following the seminar, in June 1980, a publication titled *Metropolitan Issues - Public Discussion Paper* was released. To assist in understanding the paper the Commission placed a series of advertisements in Saturday editions of *The Canberra Times* and mounted static displays in the Monaro Mall, Civic; Belconnen Mall; Woden Plaza; and the Erindale Centre, Tuggeranong. In addition, detailed briefings were arranged for a number of business, community and trade union organisations.

The main issues canvassed were as follows:

- Changed assumptions about population growth rates which, during the late 1960s and early 1970s, had been expected to continue at 8 per cent per annum, with the likely prospect that by AD 2000, Canberra's population would exceed 500 000; however, by 1976 there had been a dramatic decline in this growth rate and by June 1981 it had fallen to 1.3 per cent. In absolute terms this represented a fall from a peak annual increase of 12 000 people in 1972 to 4 500 people in 1980 (Figure 14).
- Associated with this decline of population growth rates there was also a slowing down in most sectors of economic activity (Figure 15). The workforce in the building industry decreased from over 9 000 in 1975 to about 4 000 in 1980. This was a direct result of the reduction in housing demand, the cessation of government housing construction and a significantly reduced construction programme for schools, health and community facilities generally.
- Canberra's private enterprise economy also moved from a position of high growth to low growth with the result that in one 12 month period to April 1980 there was a 4.7 per cent decline in private-sector employment. This represented a loss in one year of 1 500 jobs and was directly related to reductions in the level of government activity. Between 1971 and 1973 private-sector employment growth exceeded government-sector employment, while between 1976 and 1980 private-sector employment declined each year at an average of 3 per cent, in response to the containment of the government sector.
- The decline in the growth rates of population and employment also resulted in more significant and persistent imbalances in the provision of shopping facilities, housing and land than would have been the case under the anticipated high growth scenario of the Y-Plan assumptions because any oversupply in the provision of facilities would be quickly absorbed under conditions of higher population growth (Figure 16).
- Other significant issues were:
 - a) the decline of population in Inner Canberra, the early indicators of this problem being declining enrolments in schools in Woden, Weston Creek, Belconnen and the first settlement area of Tuggeranong
 - b) the reduced capacity of the Y-Plan caused by changed population structure and household formation rates

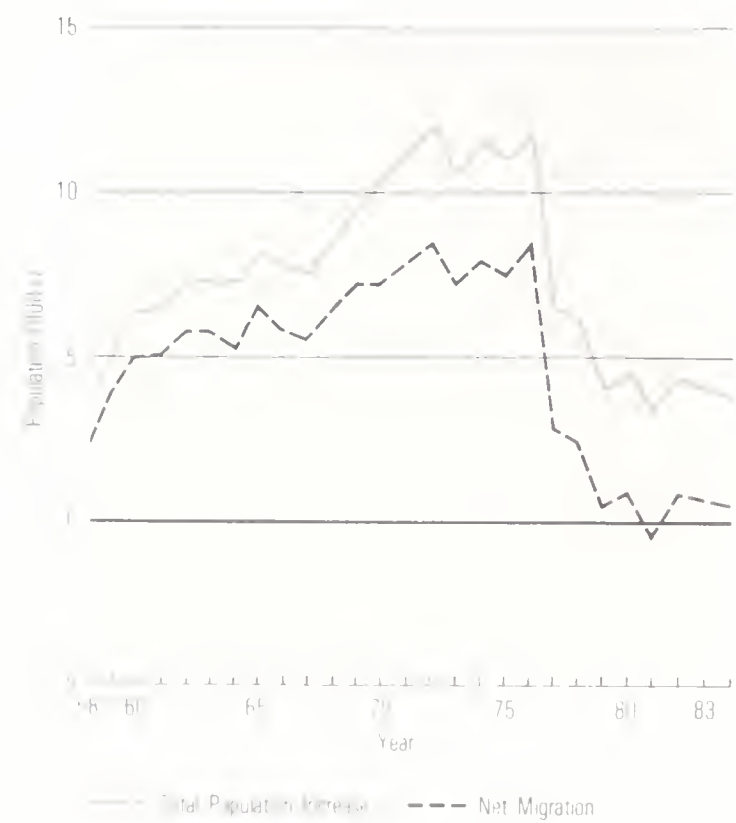


Figure 14 Growth Indicator - Population Migration

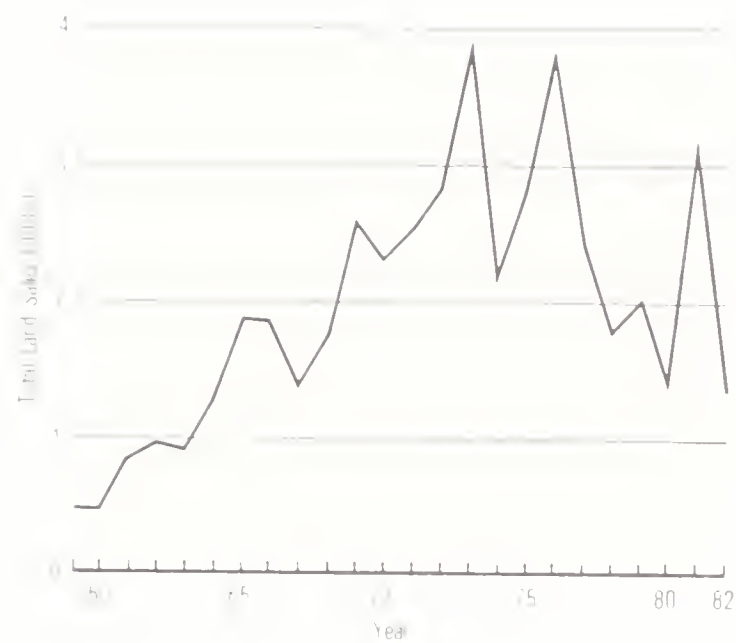


Figure 15 Growth Indicator - Residential Land and Sales

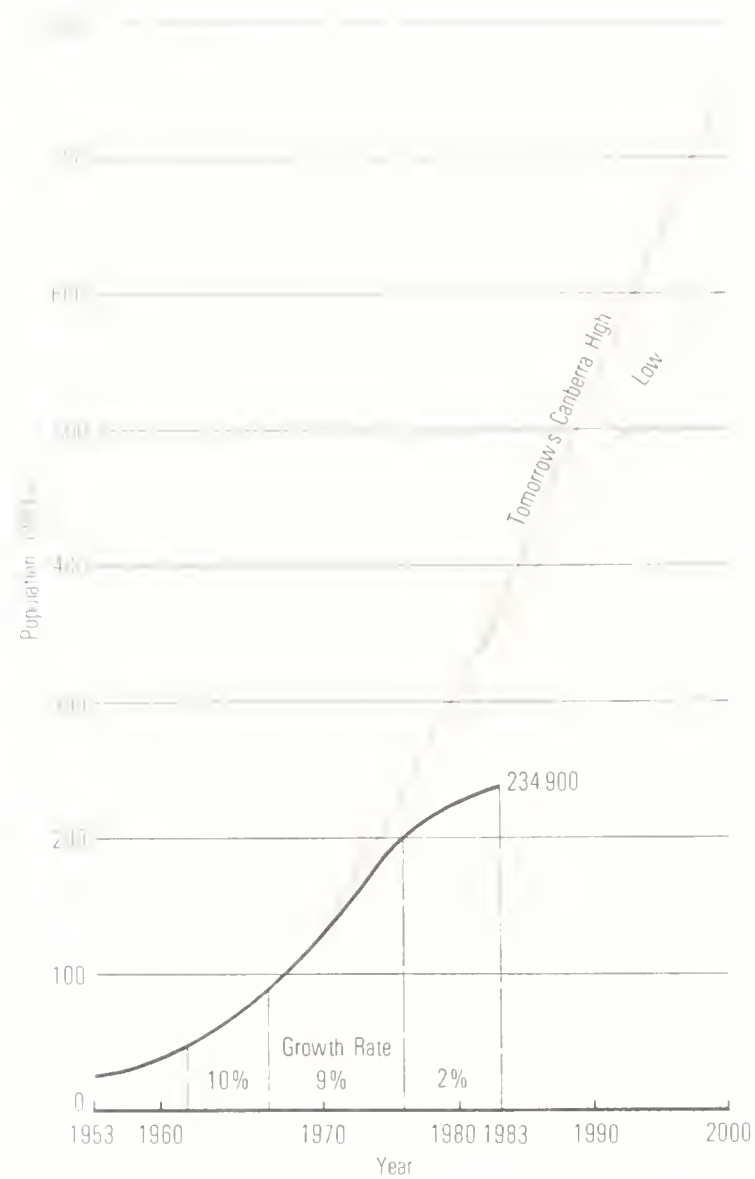


Figure 16 Population Growth Projections from *Tomorrow's Canberra*; Actual Population Growth to 1983

- c) the relative imbalance between population and retailing facilities in the City
- d) the need to maintain air and water quality
- e) the need to construct significant elements of the road network in environmentally sensitive areas.

In developing revised long-term planning and development policies to correct the imbalances noted above, the 1980 Review of the Y-Plan included an examination relating to the future phasing of the Plan. This examination assessed whether population settlement should continue in Tuggeranong or be switched to Gungahlin, and three options were identified and analysed for discussion purposes (Figure 17).

Option 1

The first option proposed the continuation of the policy which had guided the development of Canberra for the previous decade. Essentially, this option involved the development of North-East Tuggeranong, Lanyon and the northern part of West Murrumbidgee to a population level of 109 000, prior to the commencement of the next new town, Gungahlin. It implied the development of Tuggeranong Town Centre, and new employment opportunities in that centre and the Hume Industrial Estate, in order to achieve the

Option 1

To continue existing policy which is to complete the development of Tuggeranong including the early settlement of Lanyon and West Murrumbidgee and the development of the town centre.



Option 2

To develop northern Tuggeranong to a population of 70 000 (i.e. including development in Kambah, Wanniasa, Monash, Gowrie, Chisholm, Gilmore, Fadden, Macarthur, Oxley, Richardson, Calwell, Theodore, Isabella Plains), with a town centre, and then commence the settlement of Gungahlin. The development of Lanyon and West Murrumbidgee would be postponed until after Gungahlin.



Option 3

To develop north-eastern Tuggeranong (i.e. including the occupation of existing serviced blocks as well as the completion of servicing in Gilmore and Oxley) with a small centre - and then settle Gungahlin. The development of Lanyon and West Murrumbidgee would be postponed until after Gungahlin.



- Existing Land Settlement
- Land Settlement 1980-1995
- Industrial Areas
- Central Area
- Town Centres



Figure 17 Land Settlement Options - 1980

policies of partial self-containment and a balance between the location of new employment and housing to meet the needs of the expanding population.

The advantages of this option were seen as: making the optimum use of the trunk services already built in Tuggeranong; enabling Tuggeranong to be provided with a full urban structure and fulfilling the expectations of Tuggeranong residents, albeit at a slower rate than originally planned; and enhancing the opportunity to develop Tuggeranong Town Centre, at least to a scale comparable with other town centres in Canberra.

Option 2

Option 2 proposed that Tuggeranong would be developed to a capacity of 70 000 people, prior to the commencement of Gungahlin. The development envisaged completion of Kambah, Wanniassa, Monash, Gowrie, Chisholm, Gilmore, Fadden, Macarthur, Oxley, Richardson, Calwell, Theodore and the Isabella Plains area. A town centre was also to be established, while the development of Lanyon and West Murrumbidgee would be postponed until the completion of Gungahlin.

The advantages were seen as providing the opportunity to develop the Tuggeranong Town Centre to a size comparable with other town centres; fulfilling the majority of the expectations of Tuggeranong residents for community and other facilities; and in curtailing growth in the south so that lines of communication would not be extended prematurely or out of balance with development to the north.

Option 3

Option 3 proposed that development in Tuggeranong would be constrained to the north-east sector at the 50 000 population level, at which point, settlement would commence in Gungahlin. This differed from Option 2 in that some land in North-East Tuggeranong (subject to potential cost, servicing or environmental problems) would be left vacant until after the completion of settlement in Gungahlin, i.e. only land within the existing Tuggeranong development front and already provided with trunk services would be developed. In this option, the development of the Tuggeranong Town Centre was to be deferred until after the completion of Gungahlin and after commencement of the second stage of Tuggeranong development.

The advantages of this option were: it recognised the potential servicing difficulties, environmental problems and high costs associated with developing certain areas within North-East Tuggeranong; it would be less difficult to implement; it would provide a reasonable choice of housing environment; and it would optimise the community facilities provided at the Erindale Centre in the short and intermediate term.

Following release of the Metropolitan Issues Report and the advertisements in *The Canberra Times*, 198 responses were received from the Canberra community and special interest groups.

The submissions included comments on a wide range of issues, including the eight specific topics identified by the Commission for review:

- Priorities for Future Growth
- Settlement Options
- The Tuggeranong Option
- Urban Consolidation
- Town Centres
- The Natural Environment

- Transport
- Economic Development

Some of the submissions included general comments only, while others produced very detailed analyses and judgements on a number of both conceptual and specific issues.

In view of the fact that, traditionally, many residents and interest groups do not express their opinions about long-term planning intentions until particular proposals affect their neighbourhood, the Commission was impressed with the research and documentation contained in many of the submissions.

Business groups generally focused their attention on the subject of consolidation. Most felt that because of energy costs, declining school enrolments, transport and other reasons, the Commission should concentrate on measures which would increase settlement within existing areas of development. They also pointed to several areas (e.g. those occupied by the CSIRO Division of Plant Industry's Ginninderra Experiment Station and the Belconnen Naval Station, and McKellar) which they felt the Commission should assess before extending development beyond the present urban periphery. Several older residential areas were recommended for redevelopment to increase use of existing schools, shops and community facilities. Business groups also favoured restricting further major retail releases until existing centres were more fully used.

Community groups and residents generally agreed with making consolidation a higher priority, although some mixed feelings regarding Inner Canberra redevelopment were evident. Some concern about the nature of the redevelopment and its effects on the character of older neighbourhoods was expressed.

Within the wide range of issues presented by community groups, several conservation groups asked that the Murrumbidgee River Corridor be protected from development and maintained as a low-intensity use, recreational reserve.

The submissions received on the settlement options issue were quite varied. No option was enthusiastically received in its entirety. Major comments made in relation to the settlement options issue included the following:

- a considerable number of respondents expressed general support for settlement Option 3, because of a stated belief that limiting Tuggeranong development would protect the Murrumbidgee River environment and that consolidation should take priority over further peripheral development, in Canberra
- comments were made that consideration should be given to the expectations of the present residents of Tuggeranong. It was suggested these expectations include a population of at least 50 000 to 70 000 to support a town centre (even if on a smaller scale than was originally planned) and the development of Tuggeranong Lake
- comments were also made that the Commission should utilise Tuggeranong's existing infrastructure in order to achieve any economies of scale.

Generally, residents felt that it should be possible for the present inhabitants of Tuggeranong to have access to facilities comparable in range and level of facilities to those they had anticipated when they purchased houses in the area. Because Woden Town Centre is nearby, however, a major town centre in Tuggeranong was considered to be unnecessary for some time by many respondents.

The comments were both encouraging and useful and formed a significant input into later work, which involved a more detailed analysis of the issues raised in 1980.

One of the most important issues highlighted the distribution of activities between town centres. People commenting on this issue focused, to a large extent, on the particular problems facing Civic Centre. Consequently, the Commission resolved to undertake a major review of planning and development policies for Civic Centre. The *Civic Centre Policy Plan and Development Plan* was published in February 1984.

Another important issue was the provision of shopping and community facilities for Tuggeranong. In general, those commenting on the issue agreed that the residents of Tuggeranong should have an appropriate range of facilities, but did not favour a major town centre in Tuggeranong at this time. The Commission, accordingly, investigated in detail the range of facilities which could appropriately be located at the Erindale Centre, bearing in mind both the needs of the residents of Tuggeranong and the current viability of commercial development and retailing throughout Canberra. A report outlining the findings of this review was published in July 1983.

The Commission also continued work on the National Capital Open Space System and focused on the need for closer integration of planning and management, based on aesthetic, environmental and symbolic (national capital ethos) considerations. Open space requirements were assessed in relation to existing and likely future populations and also to meet the special needs of the National Capital. Information on key elements of the natural environment of the ACT was collected to enable an assessment of the impact of urban development on the various ecosystems and on rural lands. The boundaries of the system are being progressively defined.

In the period since the 1980 publication of the Metropolitan Issues Report further studies have shown that the issue of future land settlement sequence is still a key issue, not so much in terms of whether the next major development stage should occur in either Tuggeranong or Gungahlin but rather in terms of how soon and in what form should the development of Gungahlin be carried out.

This in the Commission's view is the most important metropolitan planning issue raised in this present Report. Its significance lies in the fact that to start a new 'development front' in Gungahlin has substantial fiscal implications for the government. Also the development of Gungahlin could defer but would not resolve the question of whether or not rural lands in Tuggeranong west of the Murrumbidgee River are to be preserved, and whether rural lands in NSW north of the ACT will eventually become urbanised and incorporated into Canberra.

Existing Land Use Plan and Location of Key Activities

Existing Land Use Plan

The Existing Land Use Plan (Figure 18) provides a brief description of the metropolitan structure of Canberra, depicting, in very broad terms, the location of such key activities as the main settlement areas, employment and retail nodes, recreation facilities and the network of transport routes connecting them.

Employment and retail activity is distributed among town centres and employment nodes within and adjacent to the towns, and leisure and recreation facilities are dispersed both within the town areas and within the metropolitan open space system connecting the main hill and valley systems, which surround and pass through the town areas. The main road system consists of a central arterial spine connecting the major centres and a peripheral parkway system carrying inter-town traffic to the major activity nodes.

The Towns

The main settlement areas comprise the original Federal Capital City of Inner Canberra, Woden-Weston Creek (Canberra's first new town), and the additional new towns of Belconnen and Tuggeranong.

In June 1983, the total population within the settled area of the Canberra City District was estimated at 234 900. The structure of the towns may be summarised as follows:

- **Inner Canberra**

In 1958, Canberra had a population of 39 000. North Canberra consisted of five suburbs and South Canberra had six suburbs which were partly developed. Between 1958 and 1969 another seven suburbs had been developed and the total population increased to 82 000.

The population in June 1982 was 59 400, a reduction of 22 000 over the previous 14 years. The decline was the result of mortality and out-migration to new developing areas. All Inner Canberra suburbs have declining household occupancy rates. Inner Canberra also has a significantly higher proportion of one and two-person households and older age groups.

- **Woden-Weston Creek**

Woden was the first new town designed by the Commission. According to the principle established by the Outline Plan and later the Y-Plan, it is physically separated from, but conveniently related to, Inner Canberra. Woden was originally planned as a discrete unit, but the development of an adjoining valley, Weston Creek, increased the population to a level where Woden could support a larger town centre and provide better town facilities.

The structural concept for Woden consists of twelve neighbourhoods located on the valley slopes. In the floor of the valley are the Town Centre, playing fields, large school grounds, and transport facilities. The Town Centre is located at the intersection of the main traffic routes through the valley. Weston Creek consists of eight neighbourhoods.

The development of Woden-Weston Creek is substantially complete. The population peaked in 1976 at about 63 000 people. Most suburbs in Woden are already experiencing a population decline and enrolments have begun to decline at some schools. The population of Woden-Weston Creek at June 1982 was 59 950.

- **Belconnen**

Belconnen was the second town designed by the Commission. The Town Centre is close to the geographical centre of the area, adjacent to an artificial lake, Lake Ginninderra. The road system is based on a grid pattern.

The development of Belconnen is not yet complete. The suburbs of Florey and McKellar are still to be settled and extensions to other suburbs such as Kaleen and South Bruce are yet to be constructed. When the Naval Station is relocated land will become available for an additional suburb. The planning structure of Belconnen allows for all of these future residential areas. Because development has been spread over a number of years, the older suburbs such as Aranda and Cook are experiencing a fall in population before housing development is completed in the newer areas. The population at June 1982 was 77 000.

- **Tuggeranong**

The planning of Tuggeranong has been based on the concept of 'territorial units' rather than neighbourhoods. The boundaries of territorial units are either defined by physical features which occur naturally such as ridges or significant stands of trees, or are man-made, for example, floodways which do not have visual links with the adjacent areas. Because these features normally follow the topography, territorial units in Tuggeranong vary in size. Areas such as Kambah with weaker physical constraints tend to be less contained and larger whereas areas with more striking landscape features such as Macarthur tend to be smaller and have greater identity.

At February 1984, Tuggeranong had eight local centres and two larger centres (Kambah Village and Wanniasa). No retail facilities have as yet been provided at the group centre or town centre level although the recently announced retail developments at the Erindale Centre and the Tuggeranong Town Centre will provide for the higher order shopping needs of Tuggeranong residents.

Tuggeranong experienced the greatest impact from the slowdown in metropolitan growth. The population at June 1982 was 32 800 people, although it is increasing at a rate of about 5 000 people per year.

Major Metropolitan Centres

The focus of each fully developed town is a town centre. The town centres are at the following stages of development.

- **Civic Centre**

Civic Centre is the highest order commercial centre for Canberra and the region, and in addition, provides the greatest concentration of employment opportunities. It has always been envisaged as the main local administrative and commercial centre and as an area important for tourists and visitor-associated uses. It accommodates Canberra's major cultural, leisure and entertainment facilities, is the main legal, financial and medical centre, and contains the majority of Canberra's professional and specialist functions. Employment in Civic Centre at June 1982 was approximately 16 000. There was 60 800m² of retail floorspace in Civic at September 1982.

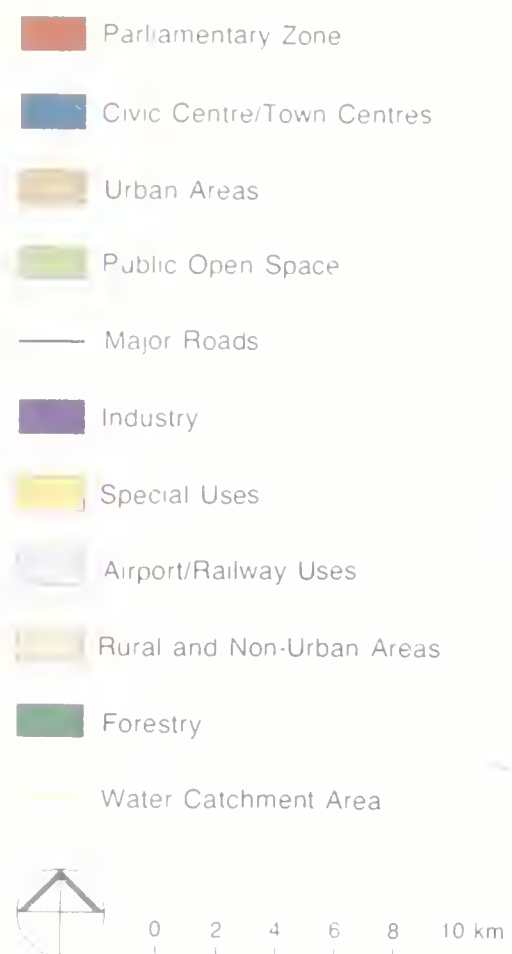
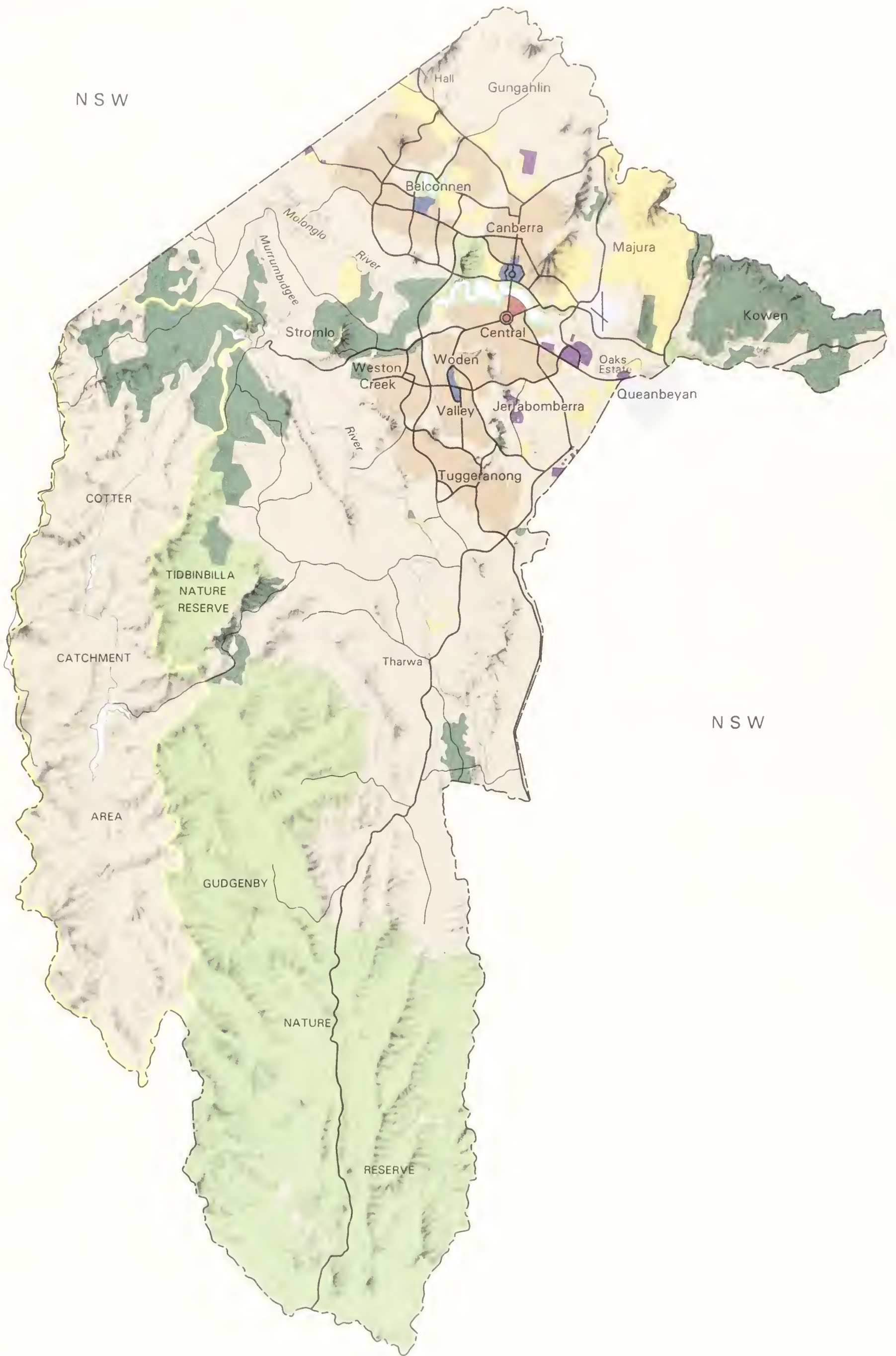


Figure 18 Metropolitan Canberra Existing Land Use Plan



- **Woden Town Centre**

Woden Town Centre was the first major centre to be constructed outside Inner Canberra. Existing development includes a mixture of government and private enterprise offices, retail facilities and service trades, community services, leisure and recreation facilities, and a major bus depot and interchange. Employment in the centre at June 1982 was approximately 9 300. There was 67 900m² of retail floorspace in Woden Town Centre at September 1982.

- **Belconnen Town Centre**

Existing development in Belconnen Town Centre comprises a retail mall, service trades, offices, institutions, bus depot and interchange, and flats and townhouses. Employment at the centre at June 1982 was approximately 8 000. This figure excludes the CCAE which is not part of the town centre. There was 67 300m² of retail floorspace in Belconnen Town Centre at September 1982.

Industry has been developed in estates, to accommodate manufacturing, processing, storage, regional service trades and public utilities.

The estates have been sited on the edge of the urban areas but in locations which conveniently service the workforce of the new towns and have good accessibility for interstate freight movements. Industrial estates are currently located at Fyshwick, Hume and Mitchell. In addition, Queanbeyan has an important role in industrial development with two major industrial estates.

At June 1982 Fyshwick had an employment level of 8 300 and was substantially completed. Hume is being developed to provide a location for rail-oriented industries. Development is also continuing at Mitchell, particularly for transport and road-haulage firms and those needing direct access to road links with Sydney and Melbourne.

In addition to the town centres and industrial areas, employment has been dispersed to locations between the towns and adjacent to the public transport spine. These have become centres for office employment and a variety of activities including hospitals and educational establishments. Employment concentrations are located at:

- Parkes/Barton
- Russell/Campbell Park
- Bruce
- South-West Deakin

The National Capital Open Space System

Within the metropolitan area, the hills and ridges have generally been kept free of urban development. They act as a backdrop for the City, and provide a means of defining the towns so that each might develop a distinctive character.

The National Capital Open Space System comprises these hill reserves and ridges, together with Canberra's lakes and foreshores, the river corridors of the Murrumbidgee and Molongo Rivers, the distant mountain areas west of the Murrumbidgee, and other major open spaces.

The System provides not only a pleasing and unifying visual background to the Capital, but also a diverse recreational, cultural and ecological resource.

The Transport System

At the metropolitan level, the system derived from the Y-Plan has two complementary components: an inter-town public transport route

connecting the town centres and running through the urban areas, and a peripheral road system designed to keep the major inter-town vehicle movements out of the urban areas.

Water Resources

The ACT forms part of the Upper Murrumbidgee Basin. The climate is essentially continental with hot summers and cold winters. Although the low rainfall (450-550 mm per year) is generally distributed throughout the year, the region experiences extended drought periods in common with the rest of inland Australia.

Under the *Seat of Government Acceptance Act* 1909 the Commonwealth has paramount rights to the waters of the Queanbeyan and Molonglo Rivers.

The regulation and diversion of streams for municipal water supply purposes is undertaken in the Cotter River to the west, and the Queanbeyan River to the east. The Naas-Gudgenby catchment to the south has been identified as a potential future source of water supply. This system and the associated network of bulk supply mains reflect to a considerable degree the development of the Y-Plan.

The metropolitan trunk sewerage system comprises a network of tunnels and interceptor sewers servicing Tuggeranong, Woden-Weston Creek, Inner Canberra, and Belconnen. Provision exists to service Gungahlin. In view of the high standard of wastewater treatment required to protect inland waters, and in the interests of economy, wastewater treatment in the ACT is largely undertaken at one plant (the Lower Molonglo Water Quality Control Centre).

The system of lakes and streams incorporated into the National Capital Open Space System is also required to transport urban stormwater and rural floodwater through the metropolitan area. The management of surface water includes the reservation of flood plains along the major drainage routes, and the provision of stormwater drains within the urban areas. These systems represent significant constraints on the configuration of metropolitan development. The waters of the ACT are generally suitable for a range of uses including swimming, boating and other forms of recreation.

Social and Economic Aspects of the City

Introduction

Expansion of the Public Service workforce has been the fundamental reason for the growth in Canberra's employment and population. As a consequence, changes in government policy have resulted in sudden shifts in the level of economic and social activity in Canberra with consequent effects on the population.

The level and types of population-based demands in the future will be closely related to the likely population and employment growth and the future characteristics of the population, particularly in terms of age and income.

Population and Employment

Aspects of population and employment are relevant to forecasts for planning and assessments of social needs. This section describes the following:

- existing employment, its distribution and structure
- recent trends in employment, which need to be studied to gain an understanding of the effects of likely future growth
- labourforce characteristics, and unemployment - two important sets of social indicators
- the existing population, its structure and distribution, and recent population trends including population decline in the older areas of Canberra
- income and expenditure effects
- population and employment balance
- population and employment forecasts.

Existing Employment

As at June 1983, the labourforce of the ACT was 115 700, of which 7 700 were unemployed. In addition, an estimated 6 000 jobs were located in Queanbeyan.

Employment Distribution

Although the employment distribution is strongly biased towards Inner Canberra, a fundamental goal of Canberra's planning has been the dispersal of employment away from the Central Area to the new towns so as to reduce the costs associated with the journey to work, congestion and pollution.

While the strategy for dispersal includes industry and retail floorspace, office decentralisation is emphasised because of the structure of Canberra's workforce. The estimated employment distribution in the ACT and Queanbeyan is shown in Table 5.

Table 5 Estimated Employment Distribution ACT and Queanbeyan - 1981

	Employment	%
Inner Canberra (1)	67 700	60.9
Woden-Weston Creek	16 000	14.4
Belconnen	15 000	13.5
Tuggeranong	1 600	1.4
Other ACT	4 900	4.4
Queanbeyan	6 000	5.4
Total	111 200	100.0

(1) Includes Fyshwick.

Table 6 Major Employment Nodes - 1982

Civic Centre	16 000
Acton	7 300
Woden Town Centre	9 300
Belconnen Town Centre	8 000
Parkes/Barton	10 650
Russell/Campbell Park	6 600
Fyshwick	8 300
Queanbeyan	6 000

The major employment nodes within these districts are shown in Table 6.

Employment Structure

Canberra’s employment structure is markedly different from other urban areas in Australia (Table 7). The most notable features are the minor manufacturing (secondary) component in the ACT and the comparatively high component of public administration and defence, which accounted for 32.5 per cent of employment in 1981.

Table 7 Employment Structure of the ACT 1971-1981 and Australia 1981 (%)

Industry Type	ACT 1971	ACT 1976	ACT 1981	Australia 1981
Agriculture/Mining	1.0	0.8	0.9	7.4
Manufacturing	5.6	4.7	3.6	17.7
Electricity	0.7	0.7	0.7	2.0
Construction	10.3	9.0	5.0	6.3
Wholesale/Retail	12.9	12.9	12.9	17.4
Transport/Storage	2.5	2.3	2.7	5.2
Communications	1.6	1.5	1.6	2.0
Finance etc.	6.0	7.1	7.6	8.4
Public Administration/Defence	32.6	31.7	32.5	5.6
Community Services	17.6	19.1	22.3	14.9
Recreation/Personal Services	6.2	4.8	5.9	5.2
Other	3.0	5.7	4.3	7.7
	100.0	100.0	100.0	100.0

The decline in construction employment from 9 per cent of the workforce in 1976 to 5 per cent of the workforce in 1981, reflected the downturn in the ACT economy during that period.

In 1981, the public sector accounted for 59 per cent of total employment in the ACT compared to 25 per cent for Australia (Figure 19).

The dominance of the government sector makes the ACT economy and social structure susceptible to changes in government policy. This has led to calls for diversification of Canberra’s economy.

Private sector activity in the ACT has essentially served the growth of the public sector.

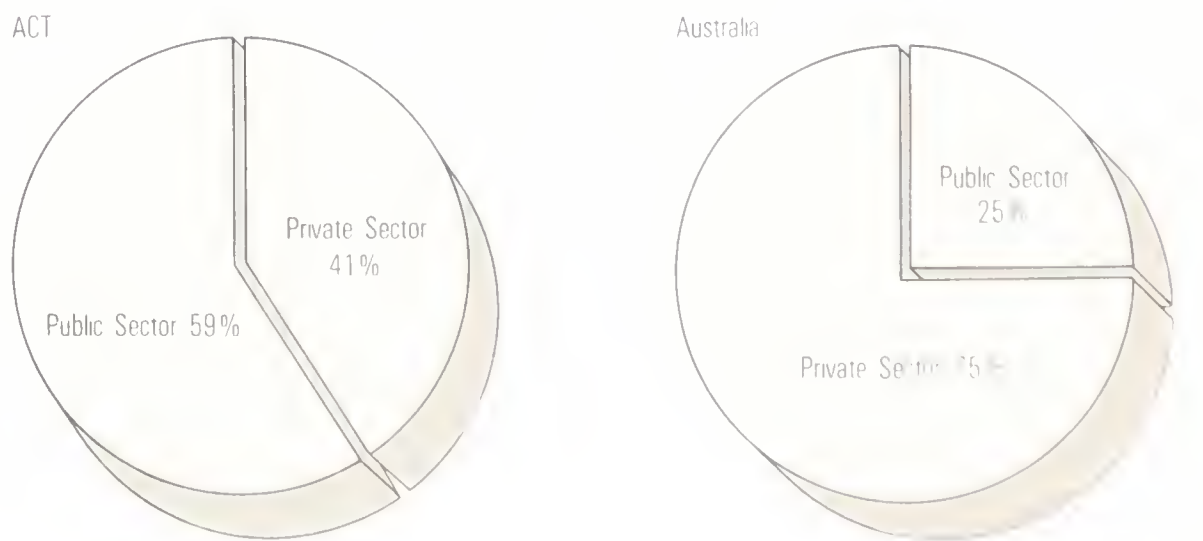


Figure 19 Government Share of Total Employment - 1981

Recent Trends in Employment Growth

Expansion of employment opportunities is the prime determinant of a city's population growth. High levels of employment and population growth occurred in Canberra in the 1960s and early 1970s, in response to high levels of government employment and investment (Figure 20). The transfer of government departments, and the subsequent growth of those departments, has been the mechanism behind the growth of private sector employment.

Public and private sector employment grew strongly until the mid-1970s when growth rates slowed considerably. During 1971-76, public sector employment increased by nearly 16 000 and the private sector by 15 000. In the following five years, 1976-81, employment in the private sector declined by some 250 positions, while the public sector increased by about 10 000.

Expansion in Public Service Act (PSA) employment has been the major impetus for employment change. During the last twenty years, PSA employment growth rates and total employment growth rates have been almost identical during both high and low growth periods.

The transfer programme has accounted for the majority of PSA employment growth in recent years. From 1971 to 1976, the transfer programme accounted for about one per cent of PSA growth. Since 1976, it has represented over 60 per cent of growth (Figure 21).

At June 1983 PSA employment accounted for 36 per cent of total employment and 64 per cent of the public sector employment within Canberra.

Labourforce Characteristics

- Major features of the ACT labourforce are:
- High Participation Rates**
The labourforce participation rate (the proportion of people 15 years and over in the labourforce) is high by Australian standards. At June 1982, the labourforce participation rate in the ACT was 68.8 per cent, compared to 60 per cent for Australia. This reflects the age composition of the population and job availability in the ACT. Between 1966 and 1982, the female labourforce participation rate rose from 45 per cent to 55 per cent in the ACT, while the Australian average rate rose from 35 per cent to 44 per cent. In Australia, between 1971 and 1982, male participation fell from 82.5 per cent to 77.2 per cent, as a result of earlier retirement, increased participation in full-time education and age structure change. In the ACT, male participation fell from 84.7 per cent to 82.1 per cent (Figure 22).
 - Highly Educated**
At June 1981, 14.1 per cent, of the population over 15 years had a Bachelor's degree, or higher, compared to the Australian average of 4.1 per cent (Figure 23). The high levels reflect the nature of employment available in the ACT. The retention rate to Year 12 in the ACT in 1981 was 68 per cent compared to 35 per cent for Australia.
 - Relatively High Income and Expenditure**
Average male weekly earnings in the ACT, at March 1983, were \$406.30 compared to the Australian average of \$345.00, reflecting the occupational structure of the workforce.
 - Increasing Part-Time Employment**
In the ACT, the share of part-time employment (people working less than 35 hours per week) increased from 11.7 per cent to 19.6 per cent between 1971 and 1981. Over the same period, the part-time employment share of Australia's total employment increased from 10.5 per cent to 16.3 per cent. Eighty per cent of employment growth between 1976 and 1981 was in part-time employment.

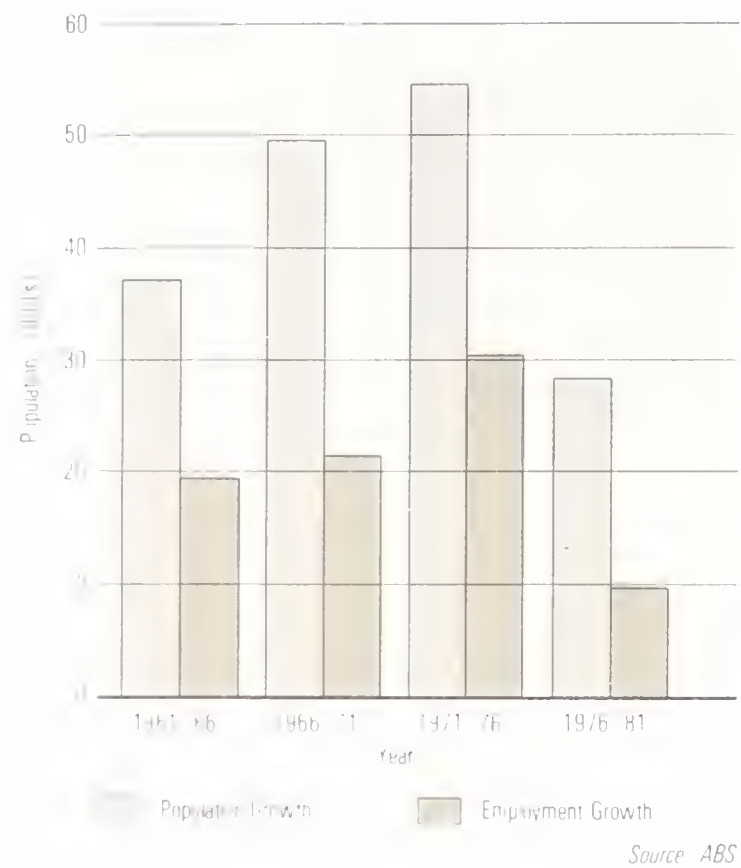


Figure 20 Population and Employment Growth

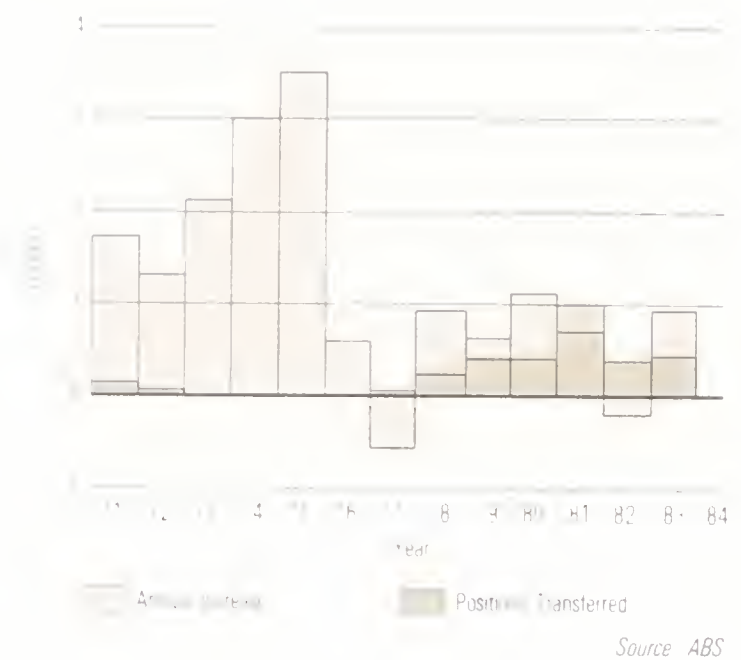


Figure 21 Public Service Act Employment ACT 1971-1983

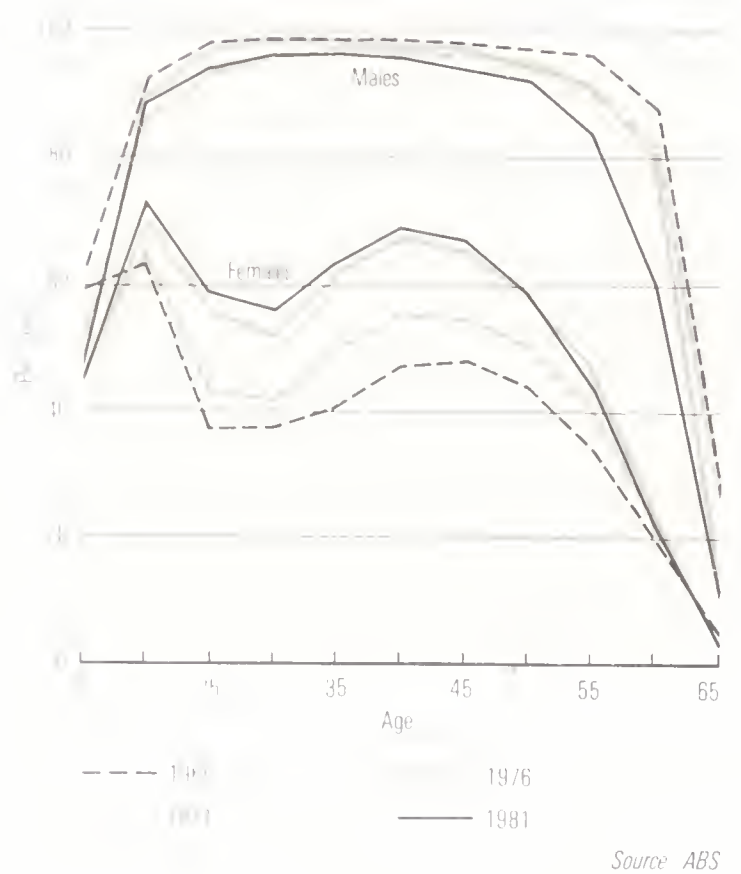


Figure 22 ACT Labourforce Participation Rates 1966-1981

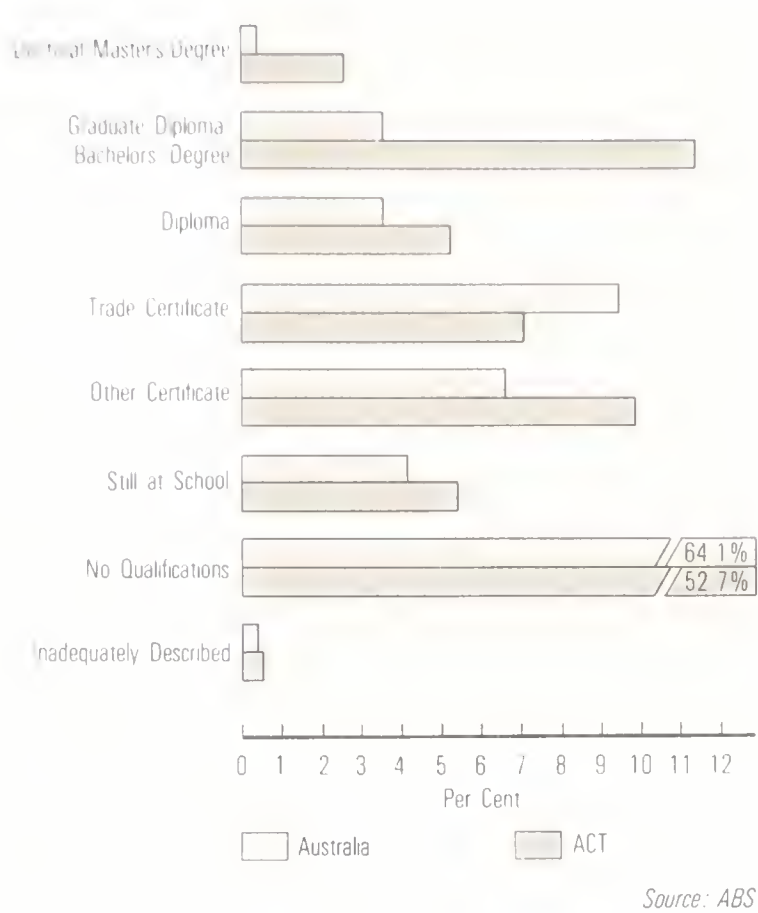


Figure 23 Educational Qualifications Australia and ACT - 1981

Between 1976 and 1981, female part-time employment increased from 29 per cent to 37 per cent of total female employment. Male part-time employment increased from 4.4 per cent of total male employment in 1976 to 11.2 per cent in 1981. Part-time employment is particularly prevalent in the retail, community service and entertainment industry sectors.

Unemployment

Between the 1976 Census and 1981 Census, the unemployment rate increased from 2.6 per cent to 5 per cent of the labourforce (Figure 24). As at May 1983, the unemployment rate was estimated to be 7.8 per cent in the ACT. This compared to 10.3 per cent for Australia.

The impact of unemployment is uneven in the community, being higher for the young, females, migrants, the disabled, and the less well educated.

The *ACT Employment Task Force Report* (1983) outlines this uneven impact. While the overall unemployment rate in the ACT is below the Australian average, the level of teenage unemployment is substantially above average. At December 1982, teenage unemployment in the ACT was 35.8 per cent compared to the Australian average of 26.3 per cent. High unemployment among teenagers is a product of their lack of experience and skills, and has also been influenced by increases in teenage rates of pay. The higher youth unemployment in the ACT is partly a product of the Territory's industrial structure which requires relatively high levels of skills.

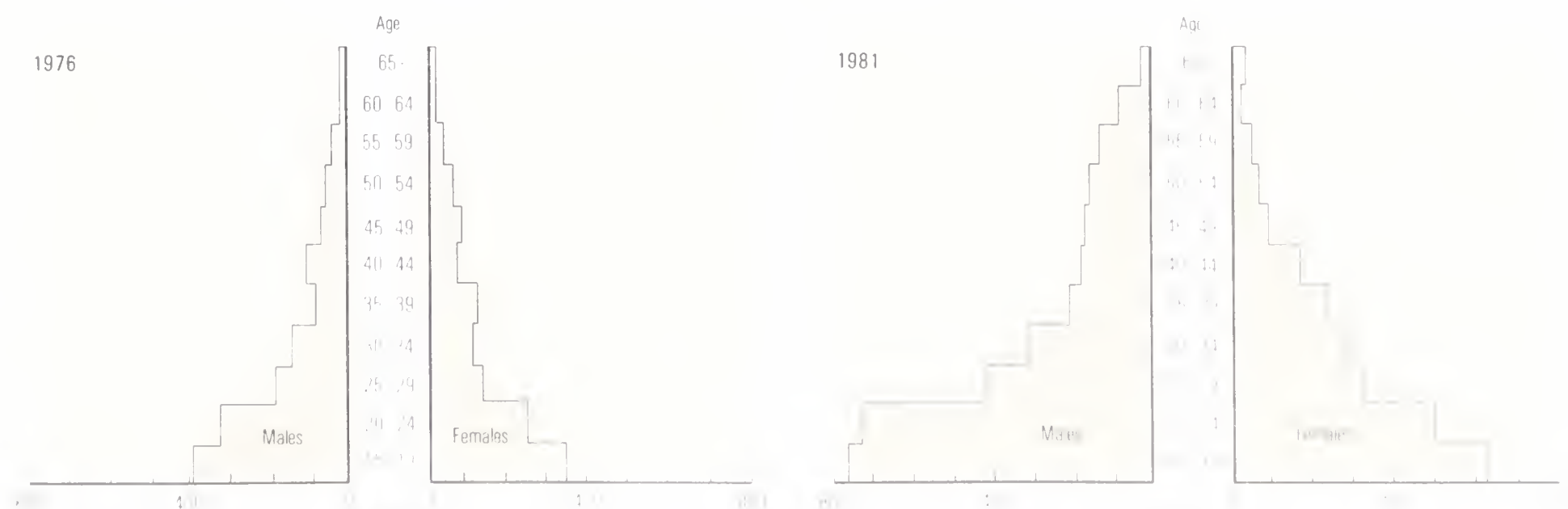
At November 1982, 8.0 per cent of females were unemployed and 7.7 per cent of males. However, the duration of unemployment is less for females. At November 1982, the average duration of unemployment for females was 20.7 weeks and for males 34.2 weeks.

The duration of unemployment increases with age. The median duration for teenagers is 17 weeks, compared to over 34 weeks for persons 45 years and over.

The 1981 Census indicates that for ACT residents who were born overseas the unemployment rate was 6.3 per cent compared to 4.5 per cent for persons born in Australia. The unemployment rate for migrants is influenced by their time since arrival in Australia. The Vietnamese in the ACT, for example, had an unemployment rate of 38.4 per cent at the 1981 Census.

The age a person leaves school also influences the likelihood of unemployment, particularly for males. Males who leave school at 15 have double the unemployment rate of those who leave school at 17.

Figure 24 Age Distribution of ACT Unemployed Persons 1976 and 1981



Tuggeranong and 4.0 per cent in Weston Creek. The unemployment level, in part, is related to the age structure of suburbs and the location of government housing. At 1981, the suburbs with unemployment above 7.0 per cent were Lyneham, O'Connor, Turner, Ainslie, Kingston, Narrabundah, Melba and the Division of Belconnen.

Existing Population

As at June 1983, the Canberra population was estimated at 234 900, and the population of Queanbeyan was estimated to be 20 150.

The distribution of the Canberra population at June 1983 was as shown in Table 8.

Table 8 Population Distribution - 1983

Inner Canberra	59 700
Woden-Weston Creek	59 700
Belconnen	76 700
Tuggeranong	38 450
Other ACT	350

Compared to the Australian pattern, the age structure of Canberra's population (Figure 26) has:

- a much lower proportion aged over 65 years
- a lower proportion in all age groups aged over 45 years
- a higher proportion of those aged 0-14 years.

Although Canberra's population shows a younger age distribution, a number of changes have occurred during the past twenty years, the most significant being:

- the proportion of 0-4 year olds has steadily declined. This is consistent with national trends
- the proportion of those aged over 45 years has steadily increased.

Nationally, the change for these groups has been only marginal.

The ageing of the population is indicated by the increase in the median age of the population from 23.6 years in 1971 to 27.1 years in 1981. In 1981, median age for the Australian population was 29.7.

Population Trends

Since 1975, the rate of population and employment growth has fallen sharply in response to contraction in the rates of growth in public sector employment.

From 1966 to 1975, the average level of population growth was 11 000 per annum, of which 73 per cent was a result of net migration. Between 1976 and 1982, inward net migration has averaged 1 000 per annum, only 22 per cent of the growth in that period (Figure 27).

Migration flows to the ACT have been dominated by young adults and children, although between 1961 and 1976 there were net gains in all age groups. Between 1976 and 1981, there was a net outflow in the 45-59 age groups (Figure 28).

It has been characteristic of Canberra's settlement that the new towns have been settled rapidly by households at a similar life cycle stage.

The age pyramids of the towns reflect their time and pace of development. The towns exhibit a 'bi-modal' profile - that is, initial

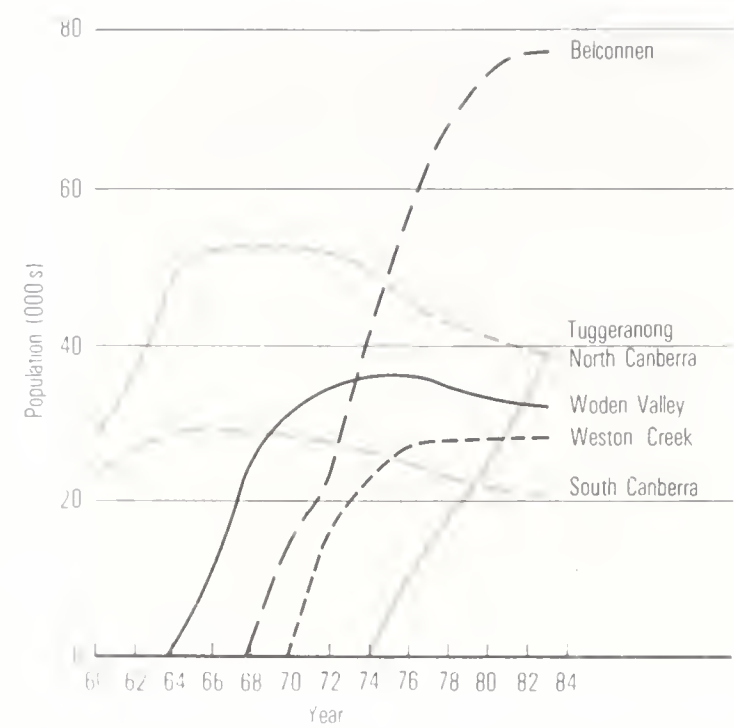


Figure 25 Population Distribution by Settlement Area 1960-1983

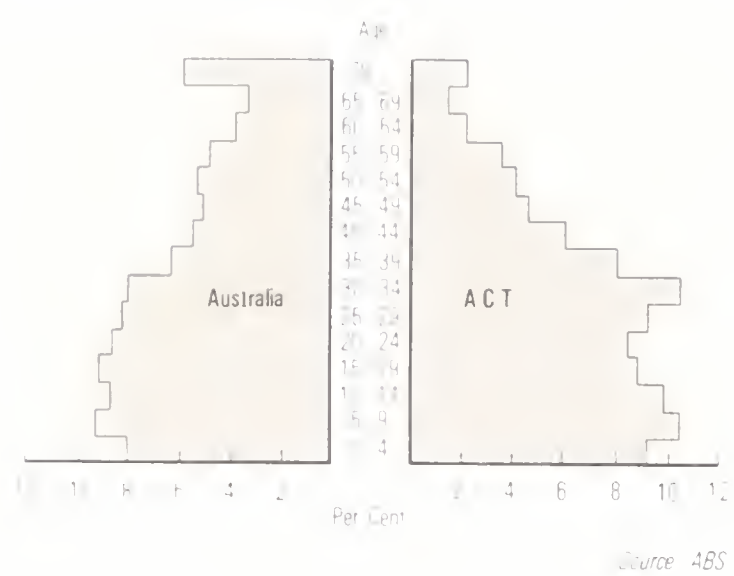


Figure 26 Age Structure of Population ACT and Australia - 1981

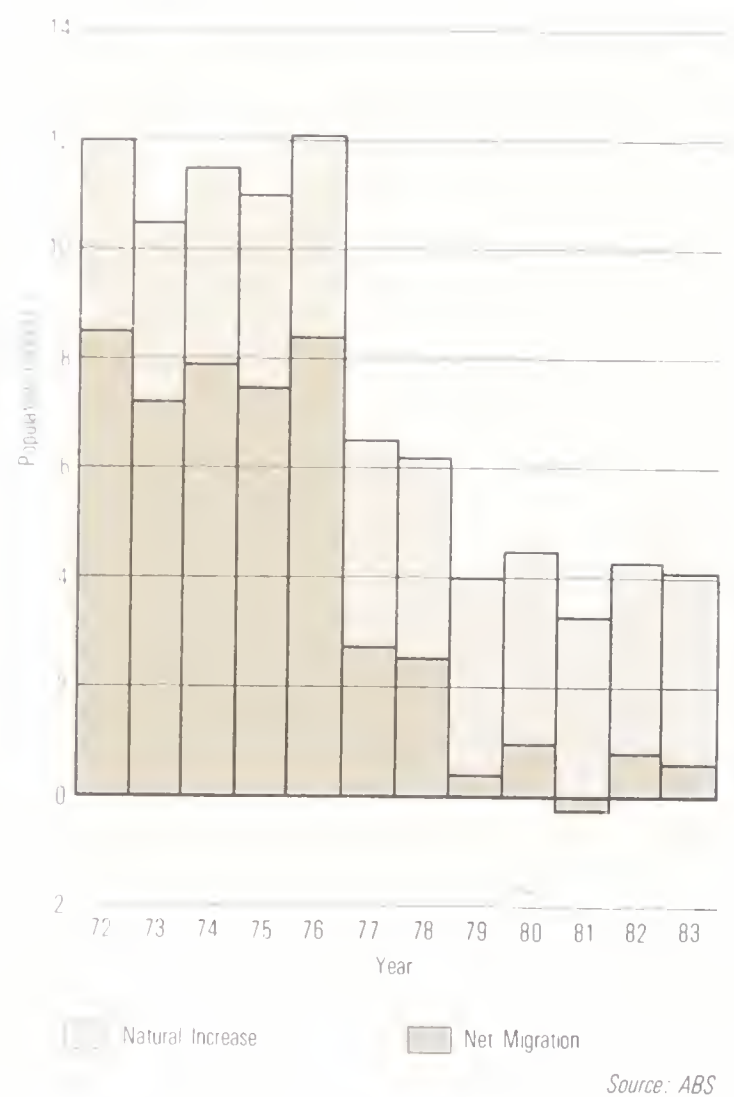


Figure 27 Annual Population Increase 1972-1983

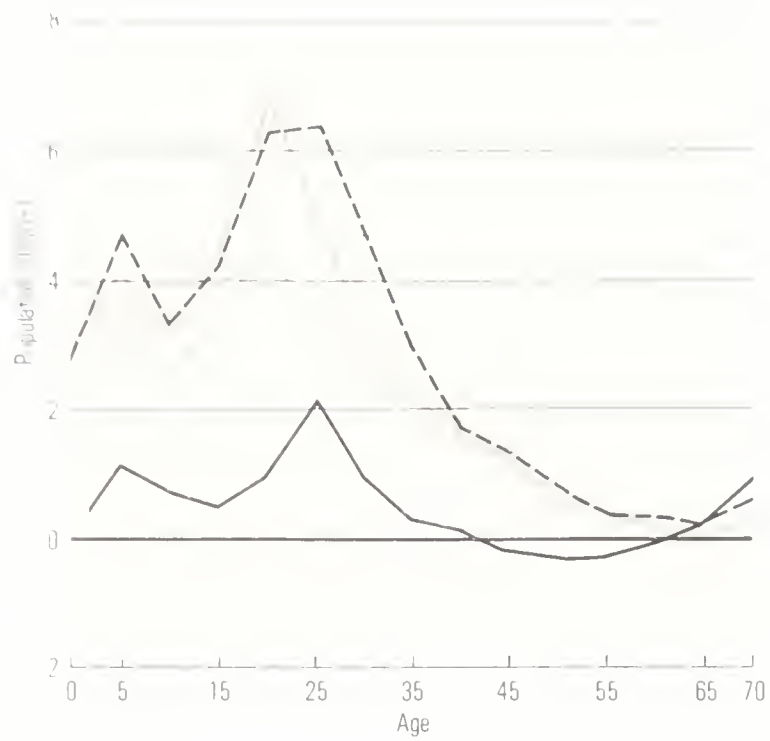


Figure 28 ACT Net Migration Age Distribution 1961-1981

settlement of the towns by young adults in the child-bearing age (Figure 29). Over time, the migration of children when they reach the 15-24 age groups to form new households in or outside the ACT and the impact of mortality, produce a marked population decline. The population of Inner Canberra has declined from a population peak of 83 000 in 1967 to below 60 000, reflecting the impact of out-migration and mortality. The process of demographic change in Inner Canberra is illustrated in Figure 30.

A survey undertaken by the Commission in North Canberra found evidence of 'regeneration' in the older suburbs, as reflected in the increase in 0-4 year olds in these areas since the 1976 Census. This 'regeneration', however, is insufficient to counteract the influence of out-migration and mortality. The new households being formed will have a lower 'peak' family size than the households they are replacing.

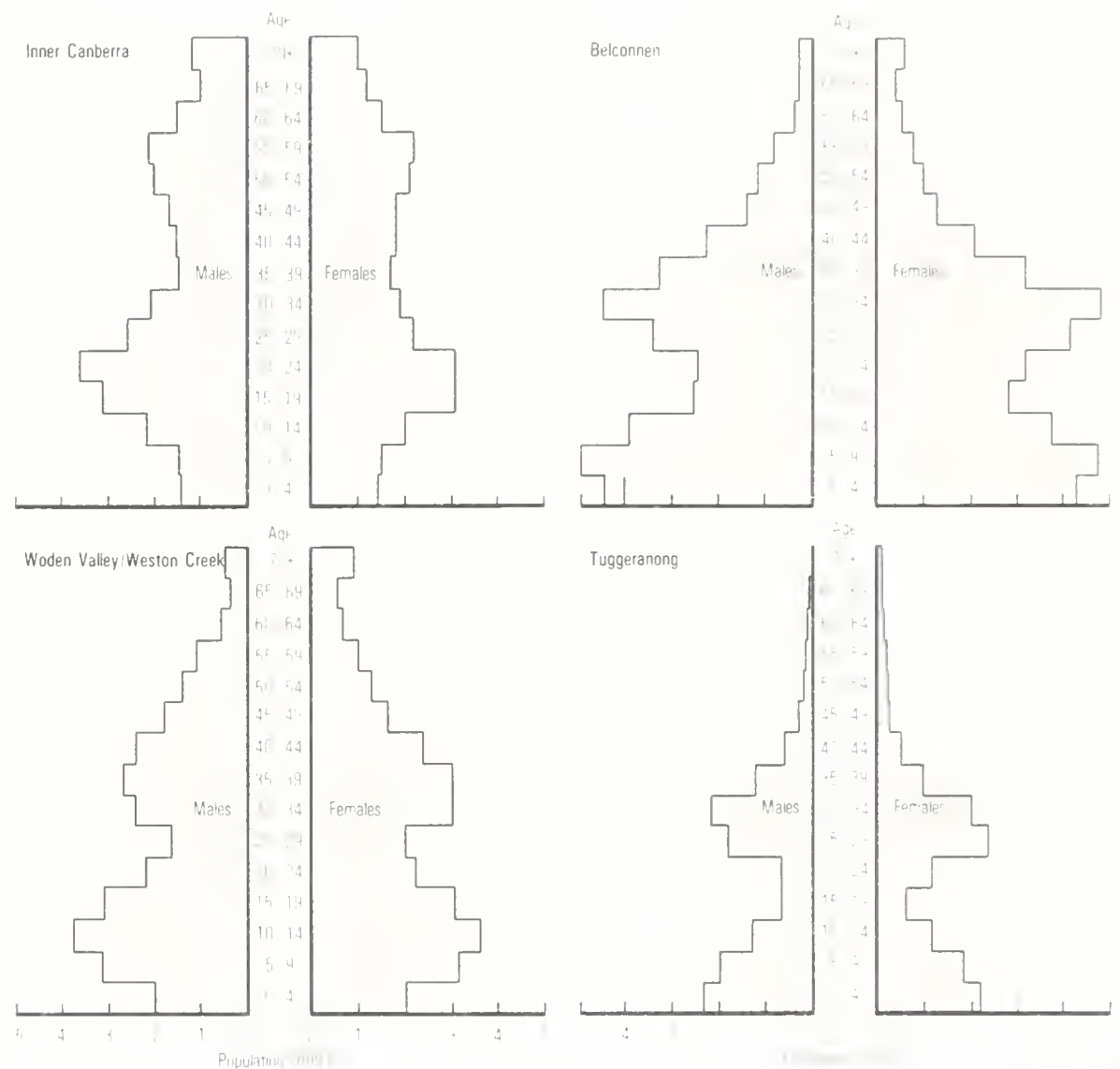


Figure 29 Age Structure by Town - 1981

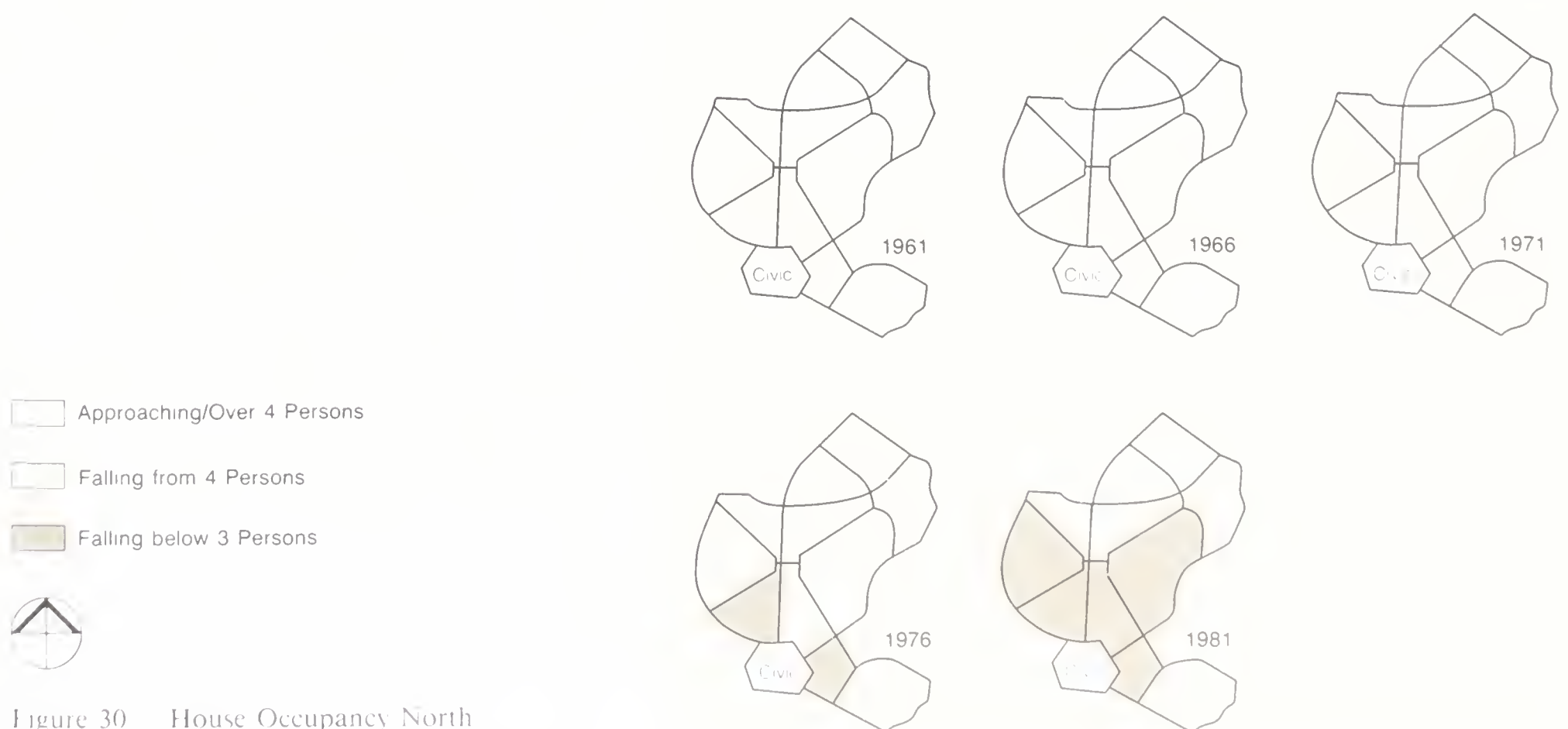


Figure 30 House Occupancy North Canberra 1961-1981

The impact of ageing and the trends towards smaller family size are reflected in town household occupancy rates (Table 9). Inner Canberra achieved peak household occupancy rates of 4.2 persons per household, while Woden and Belconnen peak household occupancy rates were 3.9 and 3.8 respectively.

While occupancy rates of 4 persons per household will be approached in individual suburbs, the slower pace of town development and demographic change will result in average town household occupancy rates of below 4 persons per dwelling. The pattern of Canberra's suburban development, characterised by rapid population build-up, has resulted in concentrations of population in specific age groups. This creates high short-term demands for age-specific facilities such as pre-schools and later primary schools and high schools. The under-utilisation of school space in the older areas of Canberra is a result of the demographic change that is taking place.

Table 9 Dwelling Occupancy by District 1961-1981 (1)

	1961	1966	1971	1976	1981
North Canberra	4.2	4.1	3.4	2.9	2.6
South Canberra	4.2	4.1	3.4	3.0	2.6
Woden	-	3.9	3.9	3.4	3.0
Weston Creek	-	-	3.5	3.7	3.4
Belconnen	-	-	3.8	3.6	3.4
Tuggeranong	-	-	-	3.3	3.5
Other ACT	n.a.	n.a.	n.a.	3.2	3.0
Average ACT	4.2	4.1	3.6	3.3	3.1

(1) Average number of persons per occupied dwelling.
(Source: ABS Census, various years)

Income and Expenditure Effects

The characteristics of the ACT population and labourforce outlined above affect the demand for facilities. The level of income a household has at its disposal is an indicator of well-being and determines the degree of access to a wide range of goods and services. The ABS 1975-76 Household Expenditure Survey found that weekly household expenditure in the ACT was 40 per cent higher than the Australian average. This higher household expenditure, in part, reflects the higher participation of women in the labourforce, which has implications for the demand and supply of childcare facilities and the demand for retail facilities outside normal trading hours. Higher household incomes result in the majority of the ACT population being affluent and mobile. Car ownership rates are high; retail sales per capita are on par with Melbourne, the highest of the State Capitals; and school retention rates for Years 11 and 12 and participation in tertiary education are above average.

Household income levels are lowest in Inner Canberra. The older North Canberra suburbs of Ainslie, Turner, Braddon and Reid had median household incomes of below \$18 000 at the 1981 Census. Other areas with low median household incomes were Barton, Kingston, Lyons, Narrabundah, Macquarie, Charnwood and the Division of Belconnen (Figure 31). This pattern is largely related to the distribution of government housing.

In part, higher average wages in the ACT are offset by higher living costs. An indication of the relative cost of living between urban areas in Australia can be obtained from established housing and food cost data. Canberra is the second most expensive capital, after Sydney, in terms of the median cost of established houses (Table 10).

The average retail price for selected food items in the June quarter 1982 placed Canberra as the second most expensive capital after Hobart (Table 11).

Table 10 Median Price of Established Houses - May 1983

	\$
Sydney	82 500
Canberra	68 400
Melbourne	55 750
Brisbane	55 750
Perth	51 500
Adelaide	49 600

Table 11 Retail Prices Index of Selected Items - June 1982

Melbourne	100.0
Sydney	102.2
Perth	103.1
Adelaide	104.5
Brisbane	104.5
Canberra	105.5
Hobart	108.3

The economic recession led to greater inequality in the Territory than had previously existed, and increased unemployment created greater demands for social welfare payments and services. Between 1974-75 and 1981-82, welfare expenditure by the Department of Territories and Local Government increased from \$2.6 million to \$8.6 million (per 1981-82 prices). Over this period expenditure on rental rebates increased from \$0.8 million to \$5.6 million, indicating the increased need for subsidised housing.

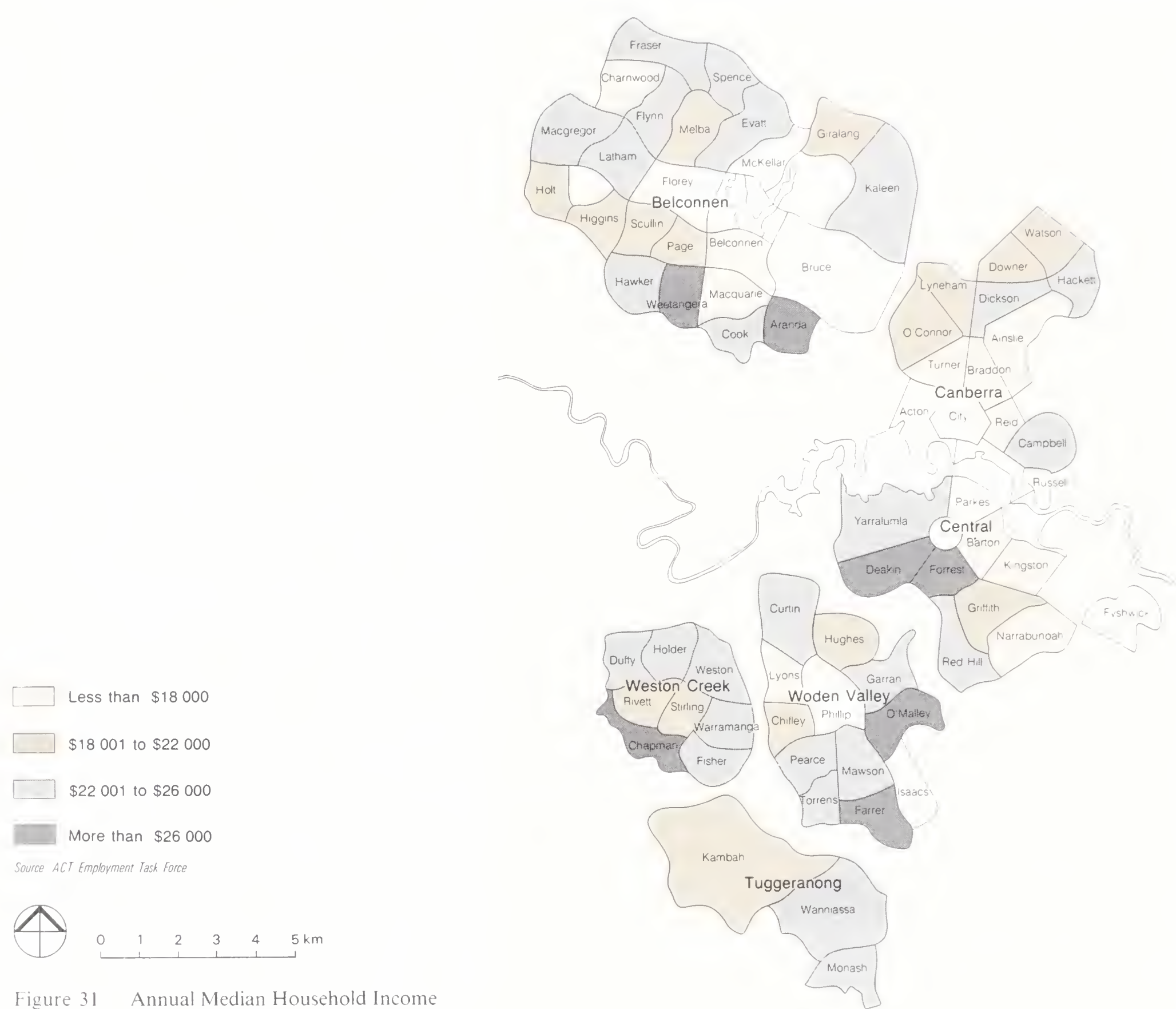


Figure 31 Annual Median Household Income by Suburb - 1981

Population and Employment Balance

The greater the co-ordination between population build-up and employment provision in a new town, the greater the likelihood of people living and working in the same town. Traditionally, employment has lagged behind population growth. Belconnen began settlement in 1967, while the first offices opened in 1975. Tuggeranong is yet to attain offices, although settlement began in 1973. The imbalance between population and employment build-up has resulted in higher levels of cross town commuting than would have otherwise resulted.

The essential justifications for the dispersal of employment are: to reduce the length and cost of the journey to work; to minimise traffic congestion; to reduce public investment; and to provide

opportunities for people to live and work in the same town. The greater the co-ordination of employment and population, the greater the benefits are likely to be.

Proximity to work is, of course, only one aspect of a household's location decision. The workplace of other members of the household; access to housing and finance; attributes of the house; house price; accessibility to other urban activities such as educational facilities, retailing and recreation; and the amenity of an area; all impact on residential location decisions. Once a residential location decision is made, there is considerable inertia to adjust that location.

In order to facilitate employment dispersal, functional groupings of government departments have been located in particular centres. Thus, Woden Town Centre has been nominated as the location of social welfare departments such as Social Security and Education. Defence functions are located at Russell Campbell Park, major policy departments at Parkes Barton, service and technical departments at Belconnen Town Centre, and civic and administrative functions in Civic Centre.

Between 1968 and 1983, the Belconnen and Woden Town Centres attained 55 per cent of the growth in PSA office employment, the main vehicle for the dispersal of employment.

Private enterprise office employment remains concentrated in Civic, while employment in statutory authorities and other government agencies remains concentrated in the Central Area.

To evaluate the employment dispersal policy an analysis of the journey to work data from the 1981 Census was undertaken.

The analysis indicated the dominance of Inner Canberra as an employment location. While Inner Canberra had 26 per cent of the Canberra Queanbeyan resident workforce, the district had 61 per cent of Canberra Queanbeyan employment. Tuggeranong on the other hand was the residence of 11 per cent of the Canberra Queanbeyan workforce yet had less than 2 per cent of the Canberra Queanbeyan employment.

North Canberra had the highest proportion of residents who lived and worked in the same town (self-containment) - 56.5 per cent compared to only 7.5 per cent in Tuggeranong (see Table 12).

Tuggeranong residents, however, took a relatively high proportion of the jobs that were available in Tuggeranong. Tuggeranong, Belconnen and Queanbeyan residents took over 60 per cent of the jobs available in their respective towns. This compared to less than 35 per cent in both Inner Canberra and Woden-Weston Creek (see Table 13).

The unequal distribution of employment between towns is reflected in the work locations of the residents of each of the towns. North and South Canberra comprise the dominant employment location for the residents of each of the towns except Queanbeyan (see Table 14).

The 1981 Census also indicated that 69 per cent of jobs at the Woden Town Centre were taken by residents of Woden, Weston Creek or Tuggeranong, and that 60 per cent of jobs at the Belconnen Town Centre were taken by Belconnen residents.

The analysis indicates that the distance from home to work is a major factor in a household's location decision. The policy of employment dispersal increases the locational choice available to a household.

The implications of the locational imbalance between employment and population are discussed in Chapter 5.

Table 12 Level of Self-Containment by District - 1981 (%)⁽¹⁾

North Canberra	56.5
South Canberra	45.3
Woden	28.0
Weston Creek	10.8
Belconnen	30.0
Tuggeranong	7.5
Queanbeyan	40.3

(1) Self-containment is the ratio of people who live and work in a district to the resident workforce of the district.

Table 13 Proportion of Jobs in a District Taken by Residents of that District - 1981 (%)

North Canberra	27.1
South Canberra	15.3
Woden	34.2
Weston Creek	51.8
Belconnen	67.5
Tuggeranong	60.3
Queanbeyan	63.1

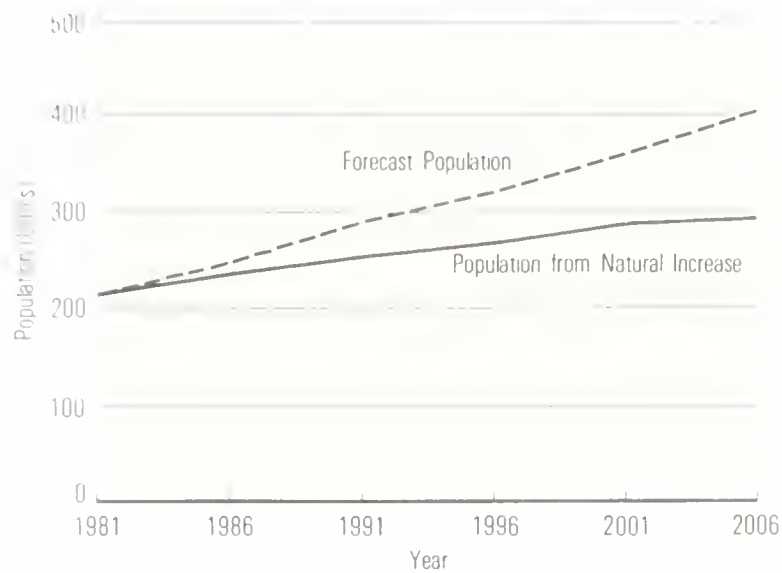


Figure 32 Population Forecasts for Canberra 1981-2006

Table 14 Work Location by Residence 1981 (PSA)

Residence	Primary Employment District	Second Employment District	Third Employment District	Other
North Canberra	56.5(NC)	19.9(SC)	9.4 (B)	14.2
South Canberra	45.3(SC)	30.6(NC)	8.6 (W)	15.5
Woden	29.1(NC)	28.0 (W)	26.3(SC)	16.6
Weston Creek	27.5(NC)	25.1(SC)	19.8 (W)	17.6
Belconnen	37.5(NC)	30.0 (B)	18.0(SC)	14.5
Tuggeranong	26.8(SC)	26.4(NC)	20.5 (W)	16.3
Queanbeyan	40.3 (Q)	24.1(SC)	15.4(NC)	20.2

Population and Employment Forecasts

The extent to which Canberra will grow will be determined largely by the number of new jobs which will be created. The level and composition of Canberra's existing population indicates that over the next twenty years natural increase alone will add some 60 000 people (Figure 32). If these are to remain in Canberra, employment opportunities will need to expand. On the other hand, natural increase creates a domestic demand for goods and services which, in turn, leads to new jobs, so that even under the circumstances of only modest economic growth there is at least a partial self-sustaining effect from natural increase and from changes in the population composition.

Two factors indicate that the rates of growth in population and employment prior to 1975 will not be repeated:

- the current PSA employment transfer programme, although not yet completed, is largely accomplished and is a non-recurring event
- the requirement for government office buildings, land, housing and associated facilities, which created many jobs in the construction industry at the time when new buildings were required to accommodate whole departments, will not recur. Future demand will be incremental and probably more constant at a lower level.

On the other hand, there are other factors which have not been part of the historical experience, but are likely to have an impact in the future. These include:

- less propensity for retirees to leave Canberra
- a greater propensity for older people to move to Canberra to join their relatives or for other social and economic reasons
- the effects of deliberate policies to attract private enterprise investment and a consequent diversification of employment, which will not only create new jobs, but also provide better opportunities for local people to stay in Canberra
- world-wide trends for white-collar tertiary employment to increase
- increasing demands by society for government intervention, which may outweigh 'small government' pressures. For example, government employment has shown an overall increasing proportion of total employment, even during the 1976-81 period
- the ACT has, over the past decade, continued to increase its share of both total Commonwealth and PSA employment, although at a slower rate during the past 5-6 years. This trend has arisen through transfers, continued growth of policy elements of departments and responses to specific government initiatives
- notwithstanding the suggestions of some commentators, the National Capital will not be complete when the New Parliament House is built. There will be new national institutions - of which the Museum of Australia is one that has already emerged - and there are others which will expand or relocate. Cultural and representative institutions of all kinds are continuing to locate in national capitals, not necessarily because of government initiative or funds, and it is not unreasonable to predict similar trends for Canberra

- the potential for growth in the tourist industry in Canberra has not yet been fully exploited. The comparatively small steps taken in the last year or two show what can be achieved by promotion and effort
- continued strong growth in the South-East Region of NSW, particularly areas close to the ACT and the South Coast, is likely to lead to increased demands for Canberra-based goods and services.

Government Employment

On balance, the historical evidence and indications of future social, political and technological changes point to the likelihood that government employment will continue to increase. It is not unreasonable to consider a long-term relationship between government activity and national population growth. The latest official population projections for Australia, prepared by the Department of Immigration and Ethnic Affairs for Commonwealth Government planning purposes, suggest a population by the year 2006 of over 21 million (1.4 per cent per annum growth). The additional propensity of the population to seek, and the government to provide, additional services would tend to increase jobs above this base level as would further concentration of government employment in Canberra.

On the basis of the factors giving rise to government employment, the Commission's assessment is that an average annual growth rate of 2.1 per cent in government employment over the plan period is a tenable basis for forward planning. This would represent an increase of 33 000 government jobs over twenty years (averaging approximately 1 700 per annum). The level of growth suggests an upturn approaching the end of the decade associated with the completion of the New Parliament House. After that, more stable growth is forecast which would be below the rate generally experienced from 1961-81 (Table 15).

Private Sector Employment

The natural increase in population, the population settlement pattern, and the level of growth in government employment, will all have an effect on the levels of employment in the private sector.

In its simplest terms, growth in the population generates employment expansion in the private sector, through demands for additional goods and services in manufacturing, construction, retail, finance and recreation, roughly in proportion to the population increase as shown in Table 16.

Table 16 Relationship Between ACT Population Growth and Private Sector Employment 1961-1981

	Population	Private Sector Employment(1)	Population to Employment ratio
1961	58 800	10 400	5.7
1966	96 000	18 400	5.2
1971	146 000	26 000	5.6
1976	203 100	35 900	5.7
1981	227 300	36 400	6.2

(1) As there is not a consistent series of Census-based government and private sector information from 1961-1981, those industries where private sector employment predominates (manufacturing, construction, wholesale/retail, finance and recreation) have been used as an indicator of long-term private sector employment trends.
(Source: ABS Census)

There are other factors which generate increases in demand for local services. For example, in the five-year period 1976 to 1981, the population of Canberra increased by 24 000, but in that same period,

Table 15 ACT Government Employment 1961-1981 and Forecast Growth 1981-2006

1961	13 300
1966	22 600
1971	35 700
1976	51 200
1981	61 600
1986	65 400
1991	77 900
1996	85 600
2001	95 000
2006	104 500

(Sources: ABS; NCDC 1971 to 1982 Population Estimates; NCDC Population Forecasts, February 1983)

some 40 000 people settled in new housing, mainly in Fuggersmann and Belconnen. The direct reason for this difference is the decline of population in older inner areas due to mortality and out migration to developing areas.

The employment effects of this settlement pattern manifest themselves in areas such as house building, new shopping centres, schools, sales of household products, extension of postal services, public transport, and other municipal services at a level which is well above that indicated by the absolute increase in population.

The other important, but rather more speculative, area of new employment is the development of ‘export’ industries in Canberra. There are encouraging signs of interest from tourist and high technology industries but their future development in the National Capital is uncertain.

Table 17 ACT Private Employment 1961-1981 and Forecast Growth 1981-2006

1961	n.a.
1966	n.a.
1971	27 800
1976	42 600
1981	42 400
1986	48 000
1991	55 200
1996	63 400
2001	71 400
2006	79 300

(Sources: ABS; NCDC 1971 to 1982 Population Estimates; NCDC Population Forecasts, February 1983)

Table 18 ACT Population and Employment 1961-1981 and Forecast Growth 1981-2006

	Population	Employment
1958	41 100	n.a.
1961	58 800	24 000
1966	96 000	42 000
1971	146 000	63 400
1976	203 100	93 800
1981	227 300	103 900
1986	249 000	113 400
1991	292 300	133 100
1996	327 200	148 900
2001	365 400	166 300
2006	403 700	183 800

(Sources: ABS; NCDC 1971 to 1982 Population Estimates; NCDC Population Forecasts, February 1983)

It is useful to note that on these forecasts Canberra’s population, as a proportion of the national population, will increase only slightly above its current level and at a slower rate than previously. From 1961 to 1981, the ACT proportion of the Australian population increased from 0.55 per cent to 1.51 per cent. Under the forecasts included in this report and the latest official national projections, the ACT share will increase to only 1.89 per cent by 2006.

Age Structure Change

Canberra’s age structure is projected to change substantially during the plan period. In 1981, 0-14 year olds represented 29 per cent of Canberra’s population. This proportion is expected to decline to about 25 per cent by 1991, and 23 per cent by 2006.

Those aged 60 years or more represented about 7 per cent of the population in 1981. By 2006, this age group may increase by over 30 000 people, or to about 12 per cent of Canberra’s population (Table 19).

Table 19 Forecast Age Structure Change 1981-2006

	0-14	15-29	30-44	45-59	60 +	Total (1)
1981	65 800	60 900	55 700	28 600	15 100	226 000
1986	67 500	63 600	64 100	33 800	20 000	249 000
1991	73 300	75 900	73 900	43 700	25 500	292 000
1996	79 700	81 500	77 300	58 600	30 100	327 000
2001	86 700	86 600	85 400	69 400	37 300	365 500
2006	94 200	90 700	94 800	77 300	46 900	403 500

(1) Discrepancies due to rounding.

The ageing of Canberra's population will result in increased demands for health and medical services. Leisure and recreation requirements will alter, as will the type of housing required. The absolute increases in school age population will require additional education investments to be made. The altered age structures, particularly at a district level, will result in changes in expenditure patterns, particularly in relation to retail goods and services.

Land and Housing

Existing Situation

At June 1983, there were some 63 900 occupied single residential dwellings and 11 200 medium-density dwellings in Canberra. Within the existing towns, including North-East Tuggeranong, there was land on which a further 16 100 single residential dwellings and 6 100 medium-density dwellings could be occupied (Table 20).

Table 20 ACT Housing June 1983

Single Residential Blocks			
	Occupied	To be Occupied	Total
Inner Canberra	17 300	200	17 500
Woden-Weston Creek	16 000	1 200	17 200
Belconnen	19 900	4 200	24 100
N-E Tuggeranong	10 700	10 500	21 200
Total	63 900	16 100	80 000

Medium-Density Units(1)			
	Occupied	To be Occupied	Total
Inner Canberra	4 700	800	5 500
Woden-Weston Creek	3 300	900	4 200
Belconnen	2 900	2 300	5 200
N-E Tuggeranong	200	2 100	2 300
Total	11 200	6 100	17 300

(1) Discrepancies due to rounding.

Recent Trends

During 1982-83, 1 300 single residential blocks and land on which 120 medium-density units could be constructed were sold.

Land sales have fluctuated greatly in response to factors such as the availability of finance and perception of the likely future supply of land. In 1980-81, 2 370 single residential blocks were sold, compared to less than 1 000 blocks in both 1979-80 and 1981-82.

The level of new housing occupations has been a better indicator of the demand for new housing. Occupation of single residential dwellings has fallen from 3 100 in 1976-77 to 1 570 in 1982-83. Medium-density dwelling occupation has been relatively stable, despite the decline in the overall housing market. In 1982-83, 620 medium-density units were occupied.

The supply of serviced land has declined markedly in recent years. At June 1983, the supply of serviced single residential blocks was nearly exhausted with about 350 single residential blocks available for sale at the Department of Territories and Local Government. The supply of medium-density sites was adequate to meet demand.

Performance of Recent Activities

In response to the population decline occurring in Inner Canberra, and the under-utilisation of schools, retail facilities and open space

that this produces, the following attempts have been made to arrest population decline:

- redevelopment of single residential blocks for aged persons only has occurred in Braddon
- government houses have been refurbished in Inner Canberra to ensure that young families are able to move back into the area
- part of the Narrabundah area has been regenerated with some houses being refurbished, some being replaced by the government and some by private enterprise
- vacant land has been released for medium-density housing and additional land is to be released
- a redevelopment area has been designated in Kingston for medium-density housing and flat development.

The Kingston area was selected for redevelopment in 1967, because of its age and pressure from residents, property owners and commercial interests for change. Despite longstanding interest among lessees, firm redevelopment proposals were not submitted until 1974. Prior to that, lower prices for newly serviced land, combined with the high prices demanded by lessees, restricted opportunities for private enterprise redevelopment. The redevelopment experience in Kingston suggests that the process of redevelopment is slow and that the benefits of consolidation are in the long term. Despite increases in the dwelling stock at Kingston, population fell, due to declining occupancy rates and vacancies. In fact, the early stages of the Kingston experience were characterised by declines in the dwelling stock, due to demolitions.

Redevelopment generally takes the form of medium-density housing and the demolition of existing standard dwellings. As such, redevelopment dwellings will be at a cost disadvantage to dwellings constructed on vacant land.

Given the overall size of the medium-density market, currently 500-600 dwelling occupations per year, and the supply of vacant sites in the new towns, the pace of redevelopment is likely to remain slow.

Medium-density dwellings have not been attractive to family groups. A medium-density housing survey by the Commission in 1980 found that medium-density housing was most attractive to young adults without children and that there was increasing attractiveness of this housing form to people 50 years and over.

Forecasts

Over the next twenty years, it is estimated that land on which 60 000 dwellings could be constructed will be required.

Between 1976 and 1983 medium-density dwelling occupations and sales have been about 25 per cent of total occupations and housing sales. Compared to previous periods, this has been a relatively high market share and may reflect the limited housing choice available in Canberra over the period and changed lending criteria of financial institutions. The future demand for medium-density housing will depend of factors such as price and the rate of household formation among young adults.

The current size of the market for medium-density housing in Canberra is about 500-600 units per year whereas the demand for standard housing is about 1 500 houses per year. For reasons of cost, lower occupancy rates and limited market share, redevelopment for medium-density housing cannot be relied upon to make much impression upon declining population levels as the various districts age.

It is likely that the medium-density housing share will be between 20 per cent and 25 per cent of total demand. This suggests that medium-density land sales will be 12 000 - 15 000 between 1982 and 2001, with the demand for standard housing being 45 000 - 48 000 blocks.

Retail

Introduction

Retailing forms a major component of the system of town, group and local centres which contributes to the social and economic life of the City. This section describes:

- existing floorspace and its distribution
- expenditure and the factors affecting it
- turnover of the various levels of the hierarchy
- the performance of elements in the retail system which have implications for planning
- industry trends
- forecasts.

Existing Floorspace

At September 1982, there was approximately 369 000m² of retail floorspace in Canberra, a provision of about 1.6m² per capita. The retail provision per capita varied from 2.06m² per capita in North Canberra to 0.2m² per capita in Tuggeranong. (These floorspace estimates relate to actual operating retail floorspace). The distribution of floorspace by hierarchy level and functional type varies substantially between districts (Tables 21 and 22). The distribution over the whole metropolitan area was as follows:

- 53.2 per cent of the floorspace was located in town centres; 20.5 per cent in group centres; 11.1 per cent in local centres; and 15.2 per cent at Fyshwick and Mitchell
- in terms of functional types, 25.1 per cent of the floorspace was in the department and variety store category; 15.2 per cent in clothing, fabric and furniture stores; 13.0 per cent in household appliance and hardware stores; 23.3 per cent in food stores; 13.4 per cent in other retail; and 10.0 per cent in services.

Table 21 Distribution of Retail Floorspace by District (m²) - September 1982(1)

	Town	Group	Local	Total
North Canberra	60 700	9 400	8 600	78 700
South Canberra	-	24 500	6 200	30 700
Woden-Weston Creek	67 900	20 300	10 900	99 100
Belconnen	67 400	16 500	12 700	96 600
Tuggeranong	-	5 000	2 600	7 600
Total	196 000	75 700	41 000	312 700

(1) Excludes Fyshwick and Mitchell.

Table 22 Distribution Per Capita of Retail Floorspace (m²) -September 1982(1)

	Town	Group	Local	Total
North Canberra	1.59	0.25	0.22	2.06
South Canberra	-	1.16	0.29	1.45
Woden-Weston Creek	1.13	0.34	0.18	1.65
Belconnen	0.88	0.21	0.16	1.25
Tuggeranong	-	0.15	0.08	0.23
Total	0.85	0.33	0.18	1.36

(1) Excludes Fyshwick and Mitchell.

Expenditure

Canberra residents' retail expenditure in 1980 (private dwellings only) was \$582 million, an expenditure level of \$2 725 per capita. Of this, 93 per cent or \$545 million was spent in the ACT.

There was an expenditure inflow into the ACT of approximately \$38 million, of which \$10.8 million was by Queanbeyan residents.

The level and distribution of expenditure is influenced by such factors as:

- time since settlement of an area. North Canberra's average per capita expenditure of \$2 378 reflects its older age structure while Tuggeranong's per capita expenditure of \$3 024 reflects its early stage of growth (Table 23)

Table 23 Expenditure by District - 1980

	Per Capita \$	Per Household \$	Total (\$ Millions)
North Canberra	2 378	6 195	85.0
South Canberra	3 088	7 560	59.8
Woden	2 972	8 750	96.2
Weston Creek	2 672	9 280	74.5
Belconnen	2 613	8 975	193.5
Tuggeranong	3 024	9 165	73.3
Average	2 725	8 205	582.3

- provision of facilities and floorspace in an area. Less than one-quarter of Tuggeranong residents' total retail expenditure, only 58 per cent of their group centre expenditure, and 64 per cent of their local centre expenditure, is spent within the town. This is the lowest of all districts for all categories (Table 24)
- the location of a centre in relation to its catchment. South Canberra and Weston Creek, which have large group centres, but no town centre within the district, have a higher than average share of expenditure at the group centre level (Table 25)
- the competition a centre receives from other centres. For example, 48 per cent of South Canberra residents' expenditure at town centres occurs at Civic and 45 per cent at Woden Town Centre (Table 26).

Table 24 Expenditure Containment - 1980 (%)

North/South Canberra	63.7
Woden-Weston Creek	66.1
Belconnen	59.4
Tuggeranong	23.5
Queanbeyan	66.3

Table 25 Expenditure Patterns by District - 1980 (%)

	Town Centre	Group Centre	Local Centre	Other	Total
North Canberra	47	26	14	13	100
South Canberra	31	40	15	14	100
Woden	50	27	13	9	100
Weston Creek	41	31	16	12	100
North Belconnen	58	17	14	11	100
South Belconnen	49	29	13	9	100
Tuggeranong	40	30	10	20	100
Canberra	47	28	14	11	100

Table 26 District Expenditure at Town Centres

	Percentage of District Expenditure at Town Centres to 'First' Town Centre	Percentage of District Expenditure at Town Centres to 'Second' Town Centre
North Canberra	64 (Civic)	23 (Belconnen)
South Canberra	48 (Civic)	45 (Woden)
Woden	76 (Woden)	19 (Civic)
Weston Creek	76 (Woden)	17 (Civic)
Belconnen	68 (Belconnen)	23 (Civic)
Tuggeranong	83 (Woden)	11 (Civic)

Turnover

In 1980, the average retail turnover per square metre in the ACT was \$1 600.

Average turnover in 1980 at town centres, excluding service trade areas, was \$1 460 per m² . The turnover averages per square metre were: Civic \$1 300; Belconnen \$1 350; and Woden \$1 740. Turnover at the town centre service trades areas was \$520 per m² in Civic and Belconnen and \$880 per m² at the Woden Town Centre (Table 27). Average turnover at group centres was \$2 190 per m² and at local centres \$1 920 per m² . Turnover rates reflect, in part, the type of floorspace found at each hierarchy level. The lower turnover rates at town centres reflect their functional mix, in particular, the high level of comparison goods floorspace.

Table 27 Turnover Per Square Metre at Town Centres - 1980

	Retail Core (\$)	Service Trades Area (\$)
Civic Centre	1 296	520
Woden Town Centre	1 742	887
Belconnen Town Centre	1 346	523
Town Centres Average	1 460	733

Performance of Elements in the Retail System

Civic Centre

From the earliest days of Canberra's retail planning, Civic was intended to be the location of goods and services requiring a metropolitan catchment and to meet the town centre requirements of the Inner Canberra population.

As the retail hierarchy has evolved and the distribution of population has changed, the retail function of Civic has altered. Presently, Civic is one of the three town centres serving the population. Fyshwick, with concentrations in household appliance and furniture sectors, and Kingston and Manuka, are additional centres performing a metropolitan role.

Competition from the Belconnen and Woden Town Centres has led to 36 per cent of North Canberra and 52 per cent of South Canberra's town centre retail expenditure occurring outside Civic. The presence of Kingston and Manuka has also led to South Canberra residents spending only 31 per cent of their retail expenditure at the town centre level compared to the Canberra average of 47 per cent.

In performing its town centre role, Civic's trading has been affected by the ageing of its catchment. Whereas average household expenditure in Canberra in 1980 was \$8 205, in North Canberra it had declined to \$6 195.

The net result of the increased competition and ageing has been for Civic's trading position to decline.

The Civic Centre Policy Plan and Development Plan outlines options for improving Civic's retail performance including residential intensification, increased employment and an improvement in Civic's retail structure.

Tuggeranong

As indicated earlier, Tuggeranong's retail provision is 0.2m² per capita as compared to the Canberra average of 1.6m² per capita. A retail survey by the Commission in 1980 found that in response to this low provision, Tuggeranong residents' expenditure within

Tuggeranong was only 23.5 per cent of their total retail expenditure compared to the average in Canberra districts of over 60 per cent.

As a result, Tuggeranong residents incurred higher travel times and costs in gaining access to shops. Between 1980 and 1983 Tuggeranong's population has increased by 14 000, most of which was in areas even further from the existing centres. The recent release of centres in Monash, Gowrie and Richardson will improve accessibility to local convenience retailing.

Tuggeranong residents still rely on centres outside the district for comparison shopping and weekly grocery shopping. The provision of larger-scale shopping centres, including the Tuggeranong Town Centre, will help overcome these deficiencies.

The restriction of floorspace in Tuggeranong not only places Tuggeranong residents at a disadvantage, but also has the effect of creating pressures for the expansion of the Woden Town Centre. In 1980, 83 per cent of Tuggeranong residents' town centre expenditure was in Woden. This inflow represented 24 per cent of Woden Town Centre's retail turnover and contributed to the substantially higher turnover at the Woden Town Centre relative to the other town centres. This 'overtrading' at Woden is expected to balance out when town centre retailing is established in Tuggeranong.

Fyshwick

The emergence of Fishwick as a retail centre was not intended. It grew in response to weak lease purpose clauses, and the non-enforcement of purpose clauses. In 1980, it attracted about 11 per cent of Canberra's retail expenditure, gaining expenditure from all districts in response to the retail opportunities available there.

At September 1982, 65 per cent of Fishwick's floorspace was in the clothing and furniture, and household appliance categories, as compared to the total Canberra proportion of 38.5 per cent. Fishwick had almost 35 per cent of Canberra's clothing and furniture sales floorspace and 30 per cent of the household appliance sales floorspace.

These activities generally require single-level and low-rent floorspace. From a metropolitan planning viewpoint, the location of such floorspace at Fishwick is not desirable. It is not central to the current and future population distribution and has led to a higher level of retail floorspace in Canberra than was intended. There is a demand for low-rent space for the types of retail activities carried out in Fishwick and the demand should be met at locations more central to the established population.

Performance of Local Centres

Local centres are provided to meet the day-to-day shopping requirements of consumers. Currently, there is pressure from some supermarket chains for the expansion of the supermarkets located at local centres. The reasons advanced are that it is necessary to incorporate a wider range of goods, to provide more storage and display space and to achieve greater efficiency. However, from the overall planning viewpoint larger supermarkets would require the wider spacing of centres which would result in longer journeys to local shopping opportunities, penalising those with low mobility.

Analysis of the ABS 1980 Retail Census indicates that the traditional local functions, such as chemists, butchers and newsagents, require an average population for support of below 3 500 people. However, these functions are not only found at the local level. Their continued viability at the local level will depend largely on the retail hierarchy found in each district and the attractiveness of the centres to their catchments.

Industry Trends

A number of broad trends in retailing have either been reinforced or have emerged during the 1970s, and play a major role in any consideration of the future of retailing in Canberra. All are common to Australian cities.

- **The Suburbanisation of Retailing**

This has occurred in response to increased mobility and affluence. Retail developments are generally of a larger size to accommodate an increased number of retail and self-service check-out systems.

- **Decline of Investment in Traditional 'Flagship' Department Stores**

From an investment point of view, the late 1970s have seen a decline of interest in building major new department stores, with emphasis being placed on the refurbishing of existing stores, or a switch of strategy towards the promotion of discount-type subsidiaries.

- **Discount Store Retailing**

While retail sales in Australia in the five years to 1978-79 grew by 12.9 per cent per annum compound, discount stores grew at a rate of 31 per cent per annum compound.

- **Continued Prosperity of Mall Retailing**

The good performance of mall retailing has been due to locations in suburban areas, management techniques, and the economies attained in the substitution of floorspace for labour.

- **'Theme Centre Retailing'**

There has been a marked swing in speciality retailing towards the development of 'bazaars' and 'village' environments, where shopping is conducted in a relaxed, well-designed environment, and where high quality materials and finishes combine in a mix of coffee shops, speciality food, clothing, giftware outlets, etc. Civic's Centrepoint exemplifies this trend.

- **Technological Change**

Already in evidence is the advent of bulk purchasing by retail chains. Not so evident are the equivalent mass distribution mechanisms, and retailers are still forced to evolve a hierarchy of distribution outlets. The advent of television and data storage/retrieval systems may radically change distribution of basic goods. The growth of 'non-shop' shopping will be assisted by increasing transportation costs, continued high levels of employment of married women and the relative high cost of in-store service.

- **Substitution of Floorspace for Labour**

There has been a trend to substitute floorspace for labour in the ACT. Floorspace per worker on ABS estimates increased from 27m² in 1976 to 36m² in 1980. While the floorspace increased by about 50 per cent between 1976 and 1980, retail employment increased by only 13 per cent from 7 790 to 8 789.

- **Size of Supermarkets**

The larger supermarket chains indicate that supermarkets of about 3 000m² are an efficient size for their operations. A population of about 20 000 is required for their support. As the supermarkets operated by the major chains have formed the major component of group centres, changes would be required in the spacing of group centres for these supermarkets to be accommodated. This would have impacts on the provision of community facilities and other retailing opportunities found at group centres.

Retail Forecasts

The 1980 level of retail floorspace provision in the ACT was not excessive, relative to the majority of State Capitals. Similarly, turnover in the ACT is above average, as is the retail expenditure per capita (Table 28).

Table 28 Comparative Retail Performance (1)

	1980 Retail Floorspace Per Capita(m ²)	Sales Per m ² (\$)	Sales Per Capita (\$)
Canberra	1.43	1 420	2 035
Sydney	1.23	1 632	2 011
Melbourne	1.49	1 377	2 036
Brisbane	1.32	1 333	1 695
Adelaide	1.74	1 132	1 943
Perth	1.49	1 352	2 012
Hobart	1.45	1 315	1 897

(1) These comparisons are based on the ABS 1980 Retail Census. ABS and Commission estimates vary, as the Commission's definition of 'retail' includes services such as restaurants, photographers and laundromats. The Commission's estimate of retail floorspace per capita in Canberra in 1980 was 1.6m², compared to the ABS estimate of 1.43m².

Little information exists on the cost side of retailing. The ABS 1980 Retail Census indicated that wages were the equivalent of 10.5 per cent of retail sales in Canberra, the lowest of any of the State Capitals. Comparative data on rent and other overhead costs were not available. These costs could be expected to be higher in Canberra, given the recent construction of much of the floorspace.

Another measure of retail health is the level of vacancies. From a peak of 361 premises vacant in June 1979, the number of vacancies fell to 90 by September 1982. This represents about 5 per cent of total retail premises. Of the 90 vacant premises, 36 were in Fyshwick or in town centre service trades areas, locations not intended for retailing. Wolinski (1) indicates that a vacancy rate of 4 per cent is an average level of vacancy in a retail system.

The ageing of the Canberra population (by the year 2001, 29.2 per cent of the population will be 45 and over, compared to 16.9 per cent in 1981) will have the effect of reducing the per capita expenditure below its current level of \$2 725. However, counteracting this is the projected increase in tourist numbers, which will increase the level of retail expenditure in the ACT. Further, the trends to substitute floorspace for labour may lead to an increase in the supportable floorspace.

The industry in the ACT expressed concern in 1980 over the level of trading, particularly at town centres. Canberra does have a relatively high provision of department and variety store floorspace.

As a guide to future planning, a provision of about 1.4m² per capita appears supportable in planned retail centres, under the Commission's wider definition of retail floorspace (Table 29). Currently personal service floorspace comprises about 10 per cent of Canberra's retail floorspace. This equates to a level of 1.25m² per capita, if personal service floorspace is excluded.

Table 29 Planned Retail Floorspace 1982-2003(1)

	Population	Floorspace Support- able in Planned Retail Centres (m ²)	Total Increase in Floorspace from 1982 (m ²)
1982	229 500	313 000	-
1991	292 500	410 000	97 000
2003	378 000	529 000	216 000

(1) Excludes Fyshwick and Mitchell.

(1) G. Wolinski, *Retail Floorspace Demand/Supply Analysis for Canberra 1981/90*. Wolinski Planning - A Study Prepared for the NCDC, 1980.

Community Facilities

The Commission plans and builds a range of community facilities for client departments or authorities, and defines sites for welfare, youth, cultural, leisure, sporting, educational, health and municipal services.

The Commission's closest working relationship with respect to social and community services is with the Department of Territories and Local Government. The Department's most significant administrative responsibilities are the maintenance and operation of municipal facilities and metropolitan functions such as childcare. The Department's role is to co-ordinate and facilitate the development of appropriate services and act as a client authority to the Commission in this regard.

The Commission directly liaises with the Department on matters of capital works and programming for the accommodation of user groups within a client umbrella. Ongoing discussions are conducted with the Department and community groups to determine the need for additional facilities in the metropolitan area.

At the metropolitan level, the most important community facilities that the Commission plans and develops for client authorities are health and education facilities.

The Capital Territory Health Commission assesses the need for and administers health facilities. There are three public hospitals in Canberra: Royal Canberra, Woden Valley and Calvary. There were 950 beds available at these hospitals in June 1982. In addition, there were 51 beds at the John James private hospital. Each of these hospitals serves a metropolitan-wide catchment and also provides services to people outside the ACT.

An important community demand to be met is that of aged persons accommodation. This accommodation is generally provided by community groups such as the Goodwin Homes or church groups, with government financial assistance. The form of aged person accommodation varies with the degree of mobility of the aged, ranging from self-care units to nursing homes for those requiring substantial medical supervision. At January 1983, there were approximately 1 170 beds in nursing homes, aged persons hostels and self-care units. About 55 per cent of the beds were in Inner Canberra which is approximately the same as Inner Canberra's share of the population aged 65 years and over. The Commission attempts to site these facilities near centres and on public transport routes. Most aged people still live at home and there are attempts by several community organisations to encourage the aged to remain at home through the provision of domiciliary services such as Meals On Wheels and emergency housekeeping.

Welfare services are provided by the Department and organisations such as the Salvation Army, St. Vincent de Paul Society and the Smith Family. The demand on their services has increased in recent times as the impact of the economic recession has deepened.

Primary and secondary schools form a basic element of the Commission's neighbourhood planning. The size of a neighbourhood is largely determined by the desirable size of primary school and shop catchments, and considerations of convenient walking distances. The emphasis on the primary school is based on its role as a focus for community activity. Primary schools are generally located near local centres. Three or four primary schools form the catchment for a high school.

Religious groups also participate in primary and secondary education with about 30 per cent of pupils enrolled at private schools.

The Catholic school system has about 85 per cent of private school enrolments.

The Anglican Church of Australia operates three Grammar schools in the ACT providing pre-school, infants and primary, and high school facilities. A number of other private schools operating include the AME school at Weston, the Trinity Christian School at Wanniassa and the Seventh Day Adventist School at Mawson.

School enrolments have declined in the older areas of Canberra. The Schools Authority has been faced with a situation of surplus space in older areas, while there are emerging demands for facilities in the newer areas. The enrolment decline has been associated with increasing schooling costs per pupil. The Schools Authority is currently reviewing its options in relation to this demand and supply imbalance.

Tertiary education facilities are located in Inner Canberra, Woden-Weston Creek and Belconnen. The Australian National University (ANU) which had 4 896 undergraduate enrolments in June 1983, is located adjacent to Civic Centre. The Canberra College of Advanced Education (CCAЕ) with enrolments of 5 874 students at June 1983, is located near the Belconnen Town Centre. The home residence of about 40 per cent of the ANU students and 15 per cent of the CCAE's pupils is further than 40 km from Canberra. There is also movement of students out of the ACT in response to the educational opportunities available, but on balance Canberra has a net inflow of students.

Canberra's three Technical and Further Education (TAFE) Colleges serve a more localised need with 95 per cent of their 23 326 pupils resident in either the ACT or Queanbeyan. They are located near Civic Centre and the Woden and Belconnen Town Centres.

The Schools of Music and Art are also located near Civic Centre. The location of tertiary education facilities adjacent to major centres allows their efficient servicing by public transport, and contributes to the interest, vitality and economic well-being of each of the centres.

Community facilities such as libraries, health centres, childcare facilities and police, ambulance and fire stations tend to be found in or near centres. Together with recreation facilities such as swimming pools, indoor leisure centres and clubs, they interact with the retailing, offices and personal services to provide a focus and opportunity for social interaction at the centres.

Sites for Scout and Guide halls are generally provided in or near neighbourhood parks. Rural camps for these organisations are also set aside.

Many cultural, community, sporting and welfare organisations do not require a specific site, and are located in available space at existing centres.

The settlement of Tuggeranong, particularly south of Erindale Drive, has coincided with the economic downturn and reduced levels of funding. As a result the provision of community facilities in the district has lagged behind population growth. The Erindale Centre has provided a focus for activity as it is the location of a secondary college and community centre including an indoor pool, meeting rooms, theatre, squash courts, childcare facilities and a gymnasium. This role will be reinforced by the 4 000m² shopping release at the centre.

The existing facilities at Erindale, however, are inadequate to cater for many community demands. The deficiency in facilities in Tuggeranong is being addressed. Shops are now open in Gowrie and

Monash and the Richardson shops should be trading later in 1984. Sites have been identified for future shops, childcare facilities and community meeting halls.

To assist the public with enquiries and to ascertain community needs, the Commission has opened an office at the Erindale Centre. The establishment of the Tuggeranong Community Council, on which major community groups such as Tuggeranong Family Action and the South Tuggeranong Progress Association are represented, will assist the Commission in the future planning of the district.

Leisure and Recreation

Open Space

Canberra's open spaces comprise two distinct types which cater for a wide variety of leisure and recreation pursuits:

- municipal open spaces (active sports areas, parkland and floodway easements) totalling about 1 700 ha
- the National Capital Open Space System, which includes certain defined metropolitan parklands and special areas totalling about 28 000 ha, and the regional open spaces of the Cotter catchment area, and Tidbinbilla and Gudgenby Nature Reserves, all lying west of the Murrumbidgee River and, together with forest plantations, totalling about 1 400 km².

Municipal Open Space

The Commission's standard provision of municipal open space includes playing fields, local and district parks, ancillary open space (floodways, etc.) and an allowance for future club facilities for tennis, lawn bowls, etc. The minimum provision in planning for these forms of open space is 4.0 ha per 1 000 population (Figure 33). In addition, provision is made for golf courses and other open spaces, which serve a wider role.

In the area of public recreation, there has been sustained pressure in recent years to reduce maintenance and management costs. This has resulted in changes both to management practices and to design. An example is the maintenance of open space, where mechanisation and the greater use of contractors have resulted in substantial cost economies.

There have also been changes in the standards of maintenance. Low-use areas are being mown less often, long grass along fences and paths is more readily tolerated, and areas not suited to mechanised maintenance have been redesigned. All of these measures will result in a different character for open space designed now and in the future.

With regard to recreation patterns, it appears there is a preference for greater diversity and more passive forms and an increase in the development of organised sporting facilities at the work place.

Over the past ten to fifteen years, there have been significant changes in most of the factors affecting leisure activities, particularly time, disposable income and mobility, and new leisure activities are continually developing. Some sports have emerged and displayed astounding growth, emphasising the need for planning multi-purpose playing fields, etc. Touch football is an example of a new sport which has emerged as a year-round activity. Other examples are baseball, and skateboard and BMX riding, which have grown in popularity to the point where special purpose sites are warranted. However, the large peak demands of new activities must be balanced against the probable long-term demands, which may be quite low in the case of some 'novelty' activities.

Recreational cycling has become popular in recent years, and experience at Lake Burley Griffin has demonstrated the extent to

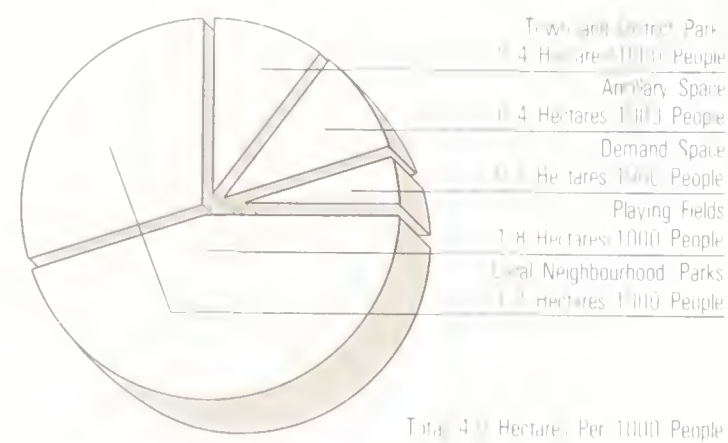


Figure 33 Formulae for Provision of Parkland and Public Open Space

which the provision of cycleways can positively encourage cycling. Other activities and demands are likely to emerge and develop in the future, with increasing leisure time.

National Capital Open Space System

Setting

The mountain ranges that rise on the western side of the Murrumbidgee River and the lines of ridges and high hills on the east that contain and shape Canberra’s urban areas form the most striking quality of the City. This mountain and tableland scenery is an essential part of the City’s landscape character and frames the views of the National Capital.

There is much to be gained by deliberately retaining certain essential physical elements of the broad landscape setting of Canberra for special design and landscape consideration. This does not mean that these areas should not contain development and that the land remain entirely public open space. Rather, the concern should be for the planning, development, landscaping and land management of these areas to be carried out consistent with clearly defined relationships. The aim would be to retain, reinforce and enhance the landscape and scenic quality of the Nation’s Capital.

Failure to do this could well lead to the destruction of the environment that might not be felt for many years, but which would deprive future generations of scenic and recreational advantages that Canberra presently enjoys and diminish the quality of the National Capital for all time.

For most cities, the aim of preserving the quality of the landscape setting of the city would be impracticable. The uniqueness, however, of the planning and land administration arrangement in the ACT with public ownership and control of land, gives the Commonwealth wide powers of decision and the community ample opportunity to influence a large range of issues that affect the use, care and management of lands in the Territory.

This situation makes it possible to propose that the hills and river corridors on the periphery of the Canberra metropolitan area, and the mountain and bushland areas west of the Murrumbidgee, should be designed and managed as an integrated open space system. These areas are collectively known as the National Capital Open Space System. This open space system represents a relatively large land area, being about 170 300 ha or 72 per cent of the ACT (Figure 34). The various components are shown in Table 30.

Table 30 Composition of National Capital Open Space System

Inner Area	ha
Hill Areas (dense forest or cleared land)	13 100
Hill Areas (pine forest)	3 600
Murrumbidgee River Corridor (including water area)	8 900
Molonglo River Corridor (including lake area and lakeside parkland)	1 390
Lower Gudgenby River Corridor (including water area)	440
Lake Ginninderra and Ginninderra Creek Corridor	370
Total	27 800
Other Areas	ha
Cotter water supply catchment area	46 900
Tidbinbilla Nature Reserve	5 060
Gudgenby Nature Reserve	60 000
Other forests and pine plantations	30 540
Total	142 500



Figure 34 Distribution of National Capital Open Space

Role and Function

Not all of the open space system is or should be public open space. Most of the area could remain in productive use for either forestry or grazing. Only about 1 800 ha would be suitable for the development of intensive or extensive recreation areas, mainly in the river corridors where there are suitable beaches with flatter margins that are suitable for recreation development.

In addition to their recreation value, the areas forming the open space system contain diverse ecological resources with scientific value and cultural resources which have historic significance.

George Seddon, in his report *An Open Space System for Canberra*, (NCDC 1979) defined the role and functions of the National Capital Open Space System under the following headings:

- symbolic - the natural landscape setting of the City's surrounds is one of the major symbolic elements of the National Capital
- showpiece - some of the elements of the open space system form primarily a display function, offering viewpoints and opportunities for pedestrian experience of Griffin's plan
- tourist and educational facilities - the open space system offers opportunities to visitors for picnicking, pleasure driving and other recreational pursuits in the easily accessible countryside surrounding

Canberra; and local educational institutions use the open space system for a range of purposes including physical, historical and ecological studies

- social - the open space system serves a social function, giving privacy to those who seek it, and giving opportunities for mixing to the gregarious
- social science value - Canberra has the opportunity, and, therefore, a responsibility to develop an integrated open space system as a model for other Australian cities
- natural science studies - the open space system contains many valuable ecological resources, including flora and fauna, natural habitats and geological monuments
- water catchment and environment protection - the hill areas, as well as providing a buffer zone between urban development and the surrounding countryside, and providing wildlife movement corridors, help to modify the effects of air pollution in Canberra by providing a breathing space between towns
- land bank - Canberra, as the National Capital, must have adequate land reserved to meet unpredictable, as well as predictable, future needs, thereby allowing flexibility in land use planning
- recreation - in Canberra, the ease of access to the countryside and the high level of car ownership has led to a pattern of recreation in which the car trip is a major component of the outing. Visual open space plays an important role during the scenic drive. An integrated open space system can cater for both active and passive recreation, and it can contain planned activities and opportunities for spontaneous ones.

It is the Commission's intention to develop the open space as an integrated system in terms of policy management and design and to constantly review use, cost and degree of user impact. The concern will be not only the preservation of the landscape and environmental quality of the ACT but also the enrichment of the recreational and environmental experience, recognising that different people use the open space system in different ways.

Trends and Forecasts

The Commission has conducted a monitoring programme on open space and recreation use since 1970. A ten-year time series is now available to help identify trends and make projections for future demands. Some of the trends identified to date are:

- in 1970, 26 000 people visited river and recreation areas on a typical fine summer Sunday. This number increased by more than 50 per cent to almost 40 000 by 1980, as shown in Table 31.
- The daily participation rates for river and lakeside recreation have remained stable since 1975, when compared to the Canberra/Queanbeyan population at 165 people per 1 000 population. On this basis, it is predicted that daily visitation to lakes and rivers will increase from 40 000 in 1980, to about 67 000 in twenty years (Figure 35).
- Parkland associated with water attracts the major usage. More than 80 per cent of demand is concentrated on Lake Burley Griffin, Lake Ginninderra and the recreation areas on the Murrumbidgee River.
- Lake Burley Griffin and Lake Ginninderra are drawing an increasing proportion of water-related recreation use, thereby reducing pressure on the more environmentally sensitive areas (Table 32).
- It became apparent in the late 1970s that travel distance was emerging as a strong influence on people's recreation habits, due to rising fuel prices.
- During the 1975-80 period, picnic areas close to urban development showed the greatest increase in popularity, with some of the more remote recreation areas experiencing reductions in use.

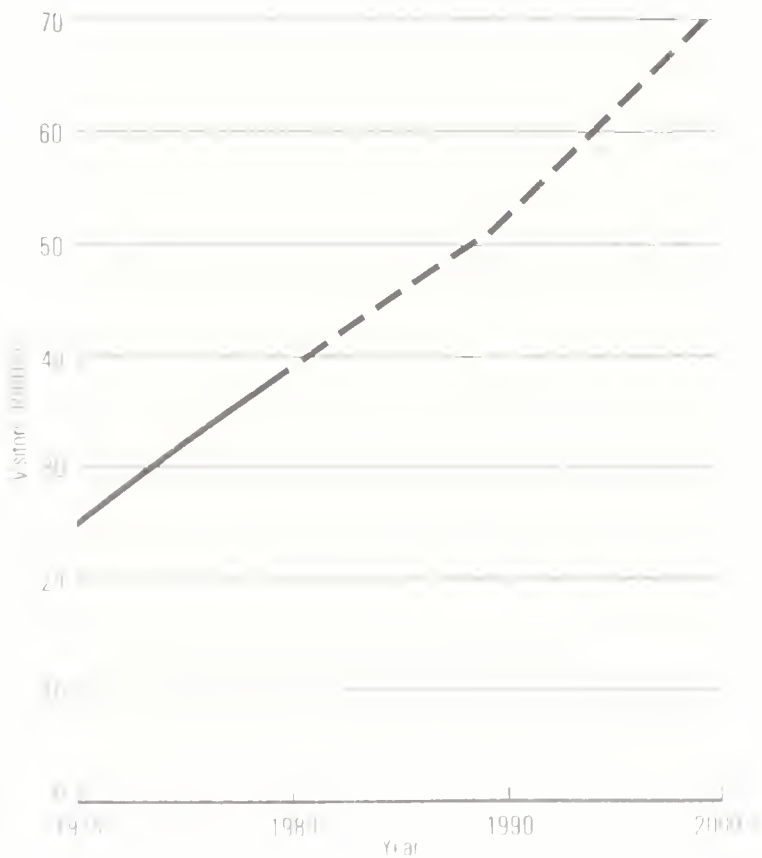


Figure 35 Demand Level for Metropolitan Open Space

Table 31 Fine Summer Sunday Outdoor Recreation Participation - 1970-1980

	Number of Visits Likely on a Fine Sunday in Summer		
	Recreation Demand 1970 (1)	Recreation Demand 1975 (2)	Recreation Demand 1980 (3)
Casuarina Sands	4 000	3 500	3 300
Cotter Playground	3 000	4 000	3 000
Cotter Pool	2 500	2 600	2 600
Other areas in Cotter			
Pierces Ck. area	-	790	560
Cotter Camping area	-	630	530
Uriarra Crossing	1 200	1 050	1 500
Kambah Pool	1 300	1 390	1 600
Pine Island	1 600	2 100	2 400
Point Hut Crossing	500	840	550
Tharwa area, incl. Smith Rd			
Bridge Area	100	200	200
Murrays Corner	250	560	590
Flints Crossing (Riverlea)	50	210	90
Tanners Flat	100	310	100
Woods Reserve	-	140	80
Gibraltar Falls	150	300	120
Corin Dam	400	550	120
Brindabella Ranges	500	560	700
Stromlo Forest	200	450	700
Uriarra Forest	150	250	250
Pierces Creek Forest	-	300	340
Kowen Forest	-	180	200
Molonglo Gorge	250	300	250
Coppins Crossing	-	40	40
Coppins Crossing North	-	-	20
Angle Crossing	150	150	150
Hall, park and showground	-	200	220
Tidbinbilla Nature Reserve	1 000	1 200	1 200
Gudgenby Nature Reserve	500	700	500
Canberra Nature Park	-	-	800
Googong Dam Foreshores	-	-	700
Ginninderra Falls	-	-	600
Lake Ginninderra	-	-	1 950
Lake Burley Griffin	8 000	10 500	14 000
Total	26 200	34 000	39 960

(1) Changing Land-use in the Canberra Region, R.W. Boden. PhD Thesis, ANU, 1971.

(2) Outdoor Recreation Demand Study: Murrumbidgee River Corridor Tuggeranong, ACT, Canberra, J.G. McMaster, 1978.

(3) River Recreation Demand Study, 1980 by J.G. McMaster on behalf of the National Capital Development Commission.

- There is increasing demand for leisure activities requiring special facilities.
- Car occupancy at riverside and lakeside sites has decreased steadily since 1970. In 1970 one hundred recreationists required 26 car spaces; in 1980 they required 33 spaces.
- The peak attendance occurs between 2.00 p.m. and 3.00 p.m. on Sunday afternoons. On average, there is a turnover of 3 vehicles for each car park space.
- Between 1975 and 1980, the Commission developed new areas at rivers and lakes at the rate of 140 new car park spaces per annum. To meet the projected daily demand of 46 600 visitors in 1990,

Table 32 Water-Related Recreation Use 1970-1980

	1970	1975	1980
Lake Burley Griffin	8 000	10 500	14 000
Lake Ginninderra	-	-	1 950
Total Water-Related Recreation	23 850	30 160	35 050
Lakes as Proportion of Total	33.5%	34.8%	45.5%

new areas are required at the rate of 85 new car park spaces per annum.

- Examination of the estimates of recreation activity in ACT forests made by officers of the Forests Branch of the Department in 1974-75 and 1979 shows a steady increase in the use of forests for picnics and barbecues. Forests offer a special environment suited to some activities, and forests near urban areas are a well-used recreation resource. Stromlo forest, for example, is heavily used for horse riding, orienteering and educational excursions, in addition to its use for picnics and barbecues.
- Upgrading of the Brindabella Road has encouraged an increasing use of the area. Visits are concentrated into a short winter period when recreation in the snow can be enjoyed.
- Visitation to Tidbinbilla Reserve is seasonal in character, and tends to peak in autumn and spring. The number of visits has increased from 97 084 in 1970 to 147 768 in 1980.
- The importance of Lanyon Homestead as an historic feature is indicated by the steady stream of visitors since 1975. On peak days in 1977, more than 1 500 visitors were recorded.
- Tourists comprise a large component of the use of the National Capital Open Space System. In 1977 it was observed that 39 per cent of all visits were made by tourists from outside the Canberra/Queanbeyan area.

Other factors will also have implications for future open space demand and supply:

- The most significant demographic change in Canberra's population over the next fifteen years will be a marked increase in the numbers of people forty years and older. This ageing of the population will influence the recreation preferences of Canberrans, their ability to pay for commercial recreation, and their expectations in terms of the public provision of facilities.
- Overcrowding occurs at most of the major river recreation areas on peak days, but even on peak days, there is capacity available at other, less popular sites. Some redistribution of demand would alleviate crowding and congestion on these days; on typical summer Sundays any crowding is usually localised.
- There have been problems with water quality in Lake Burley Griffin during the 1970s, causing lake closures for varying periods. The nature of the problems has been diverse, but it is clear that the threat to lake recreation is not diminishing.
- Increasing pressure from a growing Canberra population on the limited areas available will make preservation of water quality a paramount objective. As the development of recreation areas around the lakes intensifies, the closure of the lake waters for swimming will become increasingly unacceptable. One option is to develop swimming lagoons in purpose-built structures where water quality can be controlled. This concept has been developed in California quite successfully.

Indoor Leisure and Recreation

Indoor leisure facilities in Canberra include community halls, indoor recreation centres, tenpin bowling alleys, gymnasiums, squash courts, a basketball stadium, indoor riding schools and indoor swimming pools.

Many of these facilities are provided by private enterprise, community groups or incorporated as part of educational establishments.

Each town is served by at least one centre providing a range of these facilities:

- Inner Canberra - YMCA, Civic; Deakin Health Spa
- Woden-Weston Creek - Life Style Centre; YMCA
- Belconnen - Kippax Sports World; Life Style Centre
- Tuggeranong - Erindale Centre

Special purpose leisure facilities include the National Sports Centre and the National Exhibition Centre. Cultural facilities include the Ginninderra School House, Theatre 3 Acton, the Schools of Music and Art, Canberra and Erindale Theatres, cinemas in Civic Centre and Manuka, the Australian War Memorial and Lanyon Homestead.

Tourism

According to the Domestic Tourist Monitor Survey, the estimated number of tourists to the ACT in 1980-81 was 1.9 million, comprising 61 per cent domestic tourists, 7 per cent international visitors and 32 per cent daytrippers.

Table 33 gives the total number of people visiting the main tourist attractions in the ACT during 1981.

Table 33 Attendance at Major Tourist Attractions - 1981

Attraction	Number of Visitors
War Memorial	848 100
National Library	298 800
Royal Australian Mint	246 500
Parliament House	222 900 (1)
Regatta Point	213 800
Black Mountain Tower	449 900
High Court	389 700
Tidbinbilla	142 400
Botanic Gardens	200 000 (2)

(1) Figure is for guided tours only.
(2) Estimate.

The favoured tourist attractions in Canberra appear to be national works and government-operated activities such as the National Library, High Court, War Memorial, National Gallery, Parliament House and the Mint. These institutional elements, when coupled with the natural attractions of mountains, river corridors, urban lakes and nature reserves, offer a range of visitor attractions that has contributed to the growth of Canberra's tourist industry.

Tourists, as well as business visitors and politicians, require accommodation. Commercial tourist accommodation available in Canberra in February 1981 is shown in Table 34.

There is a strong concentration of tourist accommodation in the central areas and along the northern and southern approach routes to the City.

Table 34 Tourist Accommodation in Canberra - 1981

Hotel, Motels	2 190 rooms
Commonwealth Hostels	680 rooms
ANU, CCAE (1)	1 110 rooms
YWCA	25 rooms
Youth Hostel	40 beds
Camping, Caravanning	830 sites

(1) Minimum 345 rooms.

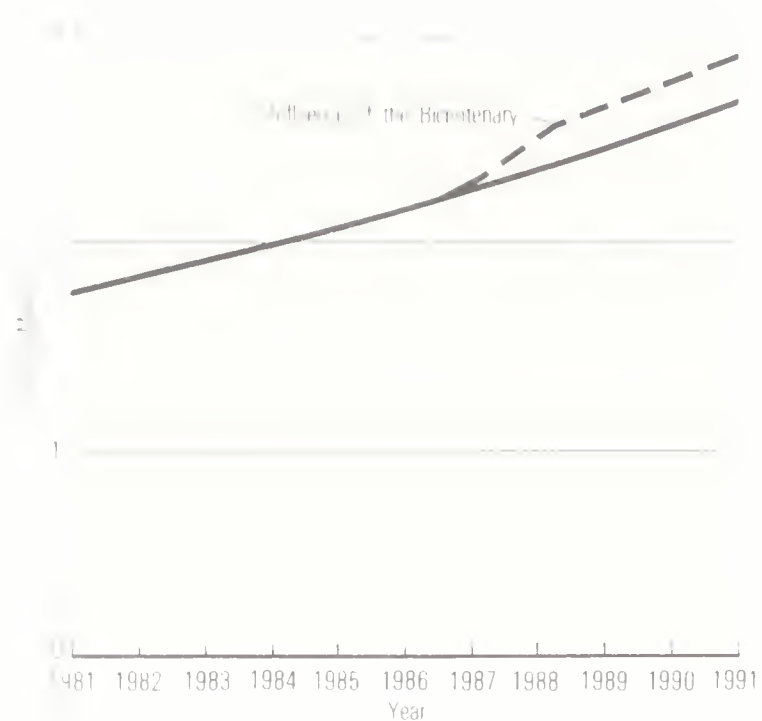


Figure 36 Estimated ACT Tourist Numbers 1981-1991

Domestic tourism in Australia increased by 3.4 per cent in 1978-79 and 7.1 per cent in 1979-80. It is expected to continue to increase at a minimum rate of 4 per cent per annum. If tourism in the ACT grows at a similar rate, tourist numbers could double in twenty years. Tourism will increase substantially in 1987 and 1988 due to the Bicentenary celebrations and visitor numbers could already be as high as 2.5 million by 1988 (Figure 36).

As other institutions of significance commence operations (for example, the Museum of Australia), they will strengthen the range of attractions offered by Canberra and may result in longer visits to Canberra by tourists.

The development of the New Parliament House and the Bicentenary celebrations provide a unique opportunity for Canberra to launch a major tourist drive, culminating in 1988. Already, some 220 000 tourists visit Parliament House each year and the New Parliament House will attract many more visitors.

The main impacts of tourist growth will be in the areas of accommodation and retailing. If the ratio of visitors to facilities remains at 1980 levels during Canberra's development over the next twenty years, a doubling of accommodation and entertainment directed to tourism will result, together with concomitant increases in visitor attendance at attractions such as the National Library, National Gallery, Parliament House and the War Memorial.

Tourist-based demand will create a need for the following specific types of facilities:

- hotels/motels
- tourist accommodation centres and other integrated developments, incorporating accommodation and attractions
- low-cost accommodation
- camping grounds and caravan sites
- private enterprise tourist attractions
- specialist retail and personal services, restaurants, cafes, clubs and bars
- indoor and outdoor recreation facilities.

Transport

Introduction

This section presents the broad characteristics of urban travel related to Canberra. It summarises information on travel patterns and provides a general description of Canberra’s road and public transport systems. The main intention is to provide an insight into how Canberra’s transport system has been planned and to provide background information related to the future travel forecasts used as the basis for the transport evaluation in Chapter 5.

Travel Patterns

Background

The 1975 Home Interview Survey contains the most comprehensive data base related to trip-making and travel characteristics in Canberra. Many of the characteristics have been confirmed as representative of today’s travel behaviour by recent surveys including:

- journey to work - (1981 Census)
- journeys related to shopping - (NCDC retail surveys)
- journeys to school - (ACT Schools Authority survey, 1980)
- traffic generation - (NCDC traffic surveys)
- public transport - (DCT Annual Reports).

The 1975 data base has, therefore, been used as a basis for most estimates, updated where more recent or accurate data were available.

Car Ownership and Trip Frequency

The average car ownership rate in the ACT is 0.45 vehicles per person (1980). On a population basis this is almost the lowest rate in Australia. Historically, the ACT has had one of the highest car ownership rates in Australia; however, during the past 6 years (1975-1980) the rate of growth in car ownership has been the lowest in Australia (Table 35).

Table 35 Number of Motor Vehicles per 1000 Population - 1975-1980

	Year ending June					
	1975	1976	1977	1978	1979	1980
NSW	419.8	426.8	435.1	446.7	457.2	470.2
VIC	447.2	466.6	470.1	487.9	498.2	490.4
QLD	413.1	445.4	463.9	485.8	504.1	523.0
SA	467.1	482.2	498.7	505.4	509.8	519.5
WA	470.7	493.4	523.7	546.0	557.5	565.6
TAS	461.8	481.1	494.9	515.1	531.0	531.6
NT	334.5	315.6	338.0	375.1	371.9	362.7
ACT	433.7	436.8	456.3	436.0	465.6	450.6
Australia	435.6	451.9	463.4	478.8	490.2	496.9

(Source: ABS Motor Vehicle Registrations Australia 1980-81)

The change in age structure (primarily the proportion of elderly and those under licence age) combined with the increasing trend towards ‘car-less’ households (Table 36) accounts largely for the declining car ownership rate.

The average daily trip generation is estimated at approximately 4.1 trips (by all modes) per person, or about 13.5 trips per household. Recent surveys indicate that each residence contributes at least 10 vehicle trip ends per day (arrivals and departures) to the total daily

traffic, and that approximately 10 per cent of these occur during the peak (see Table 37). These rates are similar to those observed in other Australian cities.

Table 36 Number of Households in the ACT by Number of Motor Vehicles - 1976 and 1981 (1)

Number of Motor Vehicles	1976 Census		1981 Census	
	Number of households	%	Number of households	%
0	3 720	6.5	5 763	8.4
1	28 400	49.8	33 804	49.3
2	18 980	33.3	22 210	32.4
3	3 462	6.1	4 234	6.2
4 or more	1 090	1.9	1 173	1.7
Not stated	1 326	2.3	1 407	2.1
Total	56 978	100.0	68 591	100.0

(1) Excludes motorcycles, motor scooters and tractors.
(Source: ABS)

Table 37 Household Car Trip Generation - 1982

Location of Sample	Number of Households	Average Weekday Trip Ends (incl. Cycle)	Average a.m. Peak Hour Trip Ends (incl. Cycle)
Farrer	55	15.7	1.3
Curtin	25	11.1	0.9
Chapman	50	14.1	1.1
Kaleen	44	11.6	1.3
Wanniassa (a)	50	13.6	1.0
Wanniassa (b)	83	9.9	0.9
Duffy	54	9.9	0.9
Average	-	12.3	1.1

Mode of Travel

A summary of the modal split (proportion of trips using the various modes of transport) for the total daily trip pattern is presented in Table 38.

Table 38 Mode Choice For All Travel on an Average Working Day - 1975 (%)

Mode	%
Bus	7.5
Taxi	0.4
Car Driver	54.6
Car Passenger	21.0
Motorcycle	1.1
Bicycle	2.1
Walking	13.3
Total	100.0

(Source: S.T.T.P. Study, Vol. I: Surveys & Data)

The minor modes (walking and cycling) account for approximately 15 per cent of all daily trips. These are usually the shorter trips, the majority of which are made by school age children. Of the remainder, travel by car accounts for almost 90 per cent.

The mode of transport used for various trip purposes is summarised in Table 39.

Table 39 Distribution of Trips by Mode and Purpose - 1975 (%)*(1)*

Mode	Home-Based Work	Home-Based Education	Home-Based Shopping	Home-Based Other	Not Home-Based
Car Driver	67.5	7.9	57.2	62.7	64.7
Car Passenger	15.6	17.9	22.3	24.3	19.4
Bus	9.0	13.2	5.2	2.3	3.8
Taxi	0.4	0.0	0.4	0.4	0.3
Motorcycle	1.8	0.3	0.8	1.1	1.0
Bicycle	0.6	8.1	1.6	1.1	0.6
Walk	5.1	42.5	12.5	8.1	10.2
% of all daily trips	22.7	14.9	12.9	29.6	19.9

(1) 'Home-Based' means a trip to or from home for a particular purpose.

Table 40 Mode Choice for Work Trips to Selected Employment Nodes - 1981 (%)

Mode	Total Canberra	City Division	Braddon	Woden	Belconnen	Barton	Russell	Fyshwick
Did Not Travel (non-participating)	8.9	6.8	6.2	7.1	8.4	4.9	4.7	4.6
Walking	3.4	2.0	3.0	3.6	1.8	1.3	1.6	0.5
Bicycle	1.9	1.8	2.0	1.9	2.0	2.4	1.8	0.3
Motorcycle	1.5	1.3	1.2	1.6	2.1	1.3	1.5	1.6
Bus	8.5	15.3	7.6	14.1	14.0	12.2	14.6	3.4
Taxi	0.4	0.4	0.7	0.2	0.2	0.2	0.4	0.2
Car Passenger	11.1	11.9	9.4	12.2	11.8	11.4	13.9	9.6
Car Driver	64.3	60.5	69.9	59.2	59.2	66.3	61.5	79.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The car is the dominant mode of transport for all purposes except journeys to and from school. Generally, buses account for less than 10 per cent of trips for any particular purpose, excluding school trips.

A summary of the modal split for journeys to work at the major employment centres is shown in Table 40.

It is estimated that the proportion of journeys by public transport to the office/retail core of each town centre is in the range 15-18 per cent. For work trips to other major employment nodes, e.g. Parkes, Barton, Russell and the service trades/industrial areas of Braddon and Fyshwick, commuter travel by bus is considerably less due to the reduced standard of service (frequency and coverage) and the greater supply of convenient parking.

Table 40 also shows that the current long-stay parking generation rate for the town centres is approximately 0.6 spaces per employee.

Average Travel Time

The average travel times for various trip purposes are shown in Table 41.

Owing to the further development of Canberra since 1975 it is thought that average travel time by bus and car may have increased slightly for all journey purposes.

Table 41 Average Travel Times For Various Trip Purposes 1975

Trip Purpose	Time in Minutes			
	Car	Bus	Cycle	Walking
Home-Based Work	19	39	17	11
Home-Based Education	11(1)	25	10	12
Home-Based Shopping	12	21	9	11
Home-Based Other	17	27	13	12
Not Home-Based	16	27	10	11

(1) Relates to car passengers only.
(Source: 1975 Home Interview Survey)

The Existing Road System

The Road Hierarchy

Canberra’s road system has been planned on a hierarchical basis to satisfy broad interrelated transport and town planning objectives. Each road type in the hierarchy has particular functions and objectives which are defined by the land uses it services and the amount of traffic it carries. It is reinforced by the use of different design standards and forms of traffic control. Basically, the hierarchy consists of:

- local access streets
- distributor roads
- arterial roads (sub-arterial and major arterial)
- parkways
- highways and rural roads.

The lower order roads, local access streets and distributor roads, provide the basic distribution function within a residential precinct or activity centre, and linkages to the main road system. The local access streets provide primary access to abutting property and are designed to appropriate standards, often incorporating narrow pavements, tight geometry and steep grades, to discourage high speeds and through-traffic. Distributor roads accumulate traffic from the local street system before the capacity of the individual local streets is exceeded, and provide for local bus operations. Traffic flow is usually controlled by priority legislation or traffic signals where warranted.

The higher order roads provide for the movement of major traffic flows, longer-distance travel and heavy freight movement. They are characterised by limited or no frontage development, higher design standards and more elaborate control techniques (signals or grade separation).

Sub-arterial roads penetrate into neighbourhoods or centres. They generally provide for intra-town movement and access to the main inter-town arterial system. These roads can be single carriageway and often have no restrictions regarding frontage development. Traffic flow is generally controlled and can involve local interruptions.

Major arterial roads are the most common of the higher order traffic routes. Their primary function is to provide a direct link between adjacent towns or to higher order roads, and to cater for very heavy traffic movements within the towns. They generally have divided carriageways or have sufficient reservation for an additional future carriageway. There is generally no frontage development and they are characterised by heavy traffic volumes operating under controlled flow conditions.

Parkways are the highest order element in the road hierarchy. Their primary function is to provide a direct link between non-adjacent towns, and to accommodate most of the long-distance inter-town

travel. Generally, they are developed in a parklike or rural setting on the edge of the urban areas. Frontage development is not allowed and access is usually strictly controlled via grade separated interchange connections with other major roads. Parkways are similar in character to freeways, in that they carry very heavy traffic volumes at high speeds.

Highways are routes of national significance, providing regional access to the ACT. They serve long-distance travellers and heavy transport. Rural roads provide primary access to neighbouring rural communities and local recreation areas. Generally, these roads are two-lane two-way roads and cater for relatively low traffic volumes.

Canberra’s hierarchical road system is considered to have a number of important advantages. These include:

- Improved residential amenity. This is achieved by attracting non-essential or through-traffic to the main road system, and reducing traffic intrusion into residential areas, resulting in improved safety and reduced traffic-related environmental impacts (noise, air and toxic pollutants).
- Reduced traffic accidents. The ACT has slightly more than half the Australian average of fatal and injury related accidents, and considerably less than any other State or Territory as shown in Table 42.

Table 42 Comparison of Fatal and Personal Injury Accidents by State/Territory for the Year Ending December 1981

	Accidents Per 100 000 Population		Persons Per 100 000 Population	
	Fatal	Injury	Killed	Injured
NSW	22	167	25	218
VIC	17	163	19	210
QLD	22	157	25	201
SA	15	181	17	239
WA	17	162	18	212
TAS	23	167	26	226
NT	51	294	57	430
ACT	11	104	13	121
Australia	20	165	22	215

(Source: ABS)

- Improved accessibility and reduced travel times to major employment, retail and recreation opportunities.
- Reduced energy consumption and air pollution due to the higher operating speeds associated with the road network.

The significance of the road hierarchy and the neighbourhood planning concept to road safety is clearly demonstrated by a comparison of accident rates of the older suburbs (where the road hierarchy is not well defined) with recently established suburbs (where a well-defined road hierarchy exists) as shown in Table 43.

The structure of road network in the older suburbs is not necessarily consistent with the hierarchical planning strategy. Many of these roads were constructed prior to formation of the NCDC and were based on different planning criteria. For example, some were designed as part of Walter Burley Griffin’s original planning concept, hence, visual impact and geometrical layout were of prime importance. The majority of these roads were never intended to carry heavy traffic volumes.

Table 43 Accident Rates for Canberra - 1975

Suburb	Reported Accidents			Accident Rate (Per Thousand Population)	
	Residential Streets	All Streets	Population (1) (000s)	Residential Streets	All Streets
Old Design					
Turner/O'Connor/Lyneham	224	575	11.5	19.5	50.8
Braddon/Reid/Campbell/Russell	331	842	9.5	34.8	88.6
Kingston/Griffith/					
Narrabundah/Red Hill	402	936	14.8	27.2	63.2
Yarralumla/Deakin/Forrest/Barton	407	1 030	9.5	42.8	108.4
Total	1 364	3 383	45.3	30.1	74.7
New Design					
Hughes/Garran	110	182	7.7	14.3	23.6
Curtin/Lyons	219	380	7.4	29.6	51.4
Chifley/Pearce/Torrens	94	146	9.3	10.1	15.7
Aranda/Cook/Macquarie	226	440	9.4	24.0	42.6
Total	649	1 108	33.8	19.2	32.8

(1) The population figures are for 30 June 1975.

Metropolitan Roads

Those roads considered to perform a metropolitan function are the arterial roads, parkways, highways and rural roads. They are shown in Figure 37. This metropolitan road network provides a high standard of service, in terms of average speed, capacity and control, to encourage use of the ‘main road system’ for all inter-district travel.

Most of the network has an 80 km/h speed limit (this excludes those roads with frontage development or within an activity centre).

In the past, metropolitan roads have been built to relatively high standards, in terms of design and capacity, and were often constructed to cater for their expected eventual traffic demands. This has resulted in some short-term, inefficient use of resources and possibly justifiable criticisms. There were, however, valid reasons for the scale of provision, the main ones being:

- Canberra was growing rapidly and it was expected that extra road capacity would soon be required. The rapid growth was not sustained
- during this period, there were economies of scale associated with larger projects
- the minimum amount of additional road capacity which can be provided at any time is one lane which may be in excess of the actual traffic volume requirements
- planning and design of the road system was not constrained by existing development as is often the case in other cities
- there were other social benefits to be obtained including: reduced energy and travel time associated with congestion-free motoring; reduced accidents; reduced impacts on public transport operations; and improved environmental conditions.

In recent times, economic and political pressures have resulted in the Commission reassessing its planning and design standards, and its implementation strategy. For example, roads which previously may have been designed and constructed as parkways may now be designed as urban arterials with subsequent reduction in design speeds and standards of intersection control, but considerable savings in terms of land take and capital costs.

The Commission’s major road planning and design standards are still, however, consistent with those used by the road planning

authorities in the other States. Essentially, road facilities are planned and designed to provide a level of service 'C' as defined in *Guide to Traffic Highway Practice* by the National Association of Australian State Road Authorities (NAASRA). This is equivalent to an 'average' rating, if the level of service concept is rated on a scale of 'excellent' through to 'unsatisfactory', as described in Table 44. Capacity is normally increased when service conditions approximate those of level of service 'D', which is rated as 'poor'.

Before they are constructed, all major road projects are ranked in order of priority with the highest ranking projects making their way into the current construction programme. There are several different criteria by which competing projects are evaluated, including safety, primary access, efficiency and environmental impact. When a project achieves construction status it may be stage constructed. The standard of provision is determined by the short-term traffic predictions with future upgrading subject to competition for funding in a future needs programme.



Figure 37 Existing Metropolitan Roads

Table 44 Level of Service Characteristics

		Level of Service				
Performance Rating		'A'	'B'	'C'	'D'	'E'
		Excellent	Good	Average	Poor	Unsatisfactory
						System Failure
A) Urban-Suburban Arterial Roads	Maximum Volume/Capacity Ratio	0.6	0.7	0.8	0.9	1.0
	Average Journey Speed (km/h)	50+	40	30	25	<25
	Proportion of Signal Cycles Fully Loaded	0.0	0.1	0.3	0.7	0.7-1.0
	Average Delay at Signals	Minimal	Reasonable	Acceptable	Approaching intolerable	Intolerable
	Average Peak Hour Factor	0.7	0.8	0.85	0.9	0.95
	Traffic Flow Conditions	Free flow	Stable	Stable with some restrictions	Approaching unstable	Unstable
B) Urban Freeways-Expressways	Maximum Volume/Capacity Ratio	0.35	0.5	0.75	0.90	1.0
	Average Operating Speed (km/h)	100+	90+	80	60	50-55
	Service Volume for 2 Lane Facility	1400	2000	3000	3600	4000
	Average Peak Hour Factor	n.a.	n.a.	0.85	0.95	n.a.
	Traffic Flow Conditions	Free flow	Higher speed range of stable flow	Stable flow	Lower speed range of stable flow	Unstable flow

- Notes:
1. Average journey speed is the total distance divided by total journey time. It includes delays at signals, etc.
 2. Average operating speed is the highest overall speed possible. It applies to freeways and other limited access roads only, since delays can generally be regarded as negligible.
 3. Peak Hour Factor (PHF) is the ratio of the volume occurring during the peak hour to the maximum rate of flow during a given time within the peak hour. For freeways, PHF is based on a maximum 5-minute flow; for arterials it is based on a maximum 15-minute flow.

Traffic Demand

The average daily traffic volume using the metropolitan road network (1982) is shown in Figure 38. It is estimated that up to 450 000 daily car trips made up these volumes.

Currently, some of the major roads are experiencing congestion for a short time during the peak periods of travel. These roads are identified in Figure 39.

Several factors contribute to the congestion problems:

- the roads in Canberra's older suburbs were built to cater for neither the speed of the modern motor vehicle nor the volumes of traffic experienced in a city of 250 000 people
- local inefficiencies occur at some major road intersections, e.g. traffic capacity is reduced to increase safety by introducing 4-phase signal cycles
- some major elements of the metropolitan road network are incomplete, e.g. Glenloch Interchange is incomplete because the parkway connections to the north are not yet required.

Works to resolve many of the problems are currently either in progress, are identified in the needs programme or are at the planning and design stage. Some of the works in progress include Hindmarsh Drive duplication, Dairy Flat Road Pialligo Road roundabout and Coranderrk Street widening. Future works include the Eastern Parkway and John Dedman Parkway Arterial.

A higher degree of congestion exists and is tolerated in the vicinity of the main commercial and employment centres. These conditions

are a necessary consequence of providing high accessibility, circulation and movement flexibility in these areas. As such, congestion problems will always exist due to the sharing of rights-of-way between conflicting, heavy demands. A high cost or reduced accessibility would be incurred in attempting to alleviate these problems which occur for less than 1-2 hours per day. The situation has worsened over time due to the continued growth of the centres.

Civic is recognised as having the most significant congestion problems on both the primary access roads and the internal distribution system. Congestion on the primary access roads is due to the following factors:

- approximately half of the traffic entering Civic passes through it. Opportunities for suitable by-pass roads are limited
- most of the major approach roads are operating near their operational capacity, and opportunities to provide significant improvements are restricted by existing bridges or adjacent development.

The capacity of the internal distribution roads is also influenced by:

- the number of signals

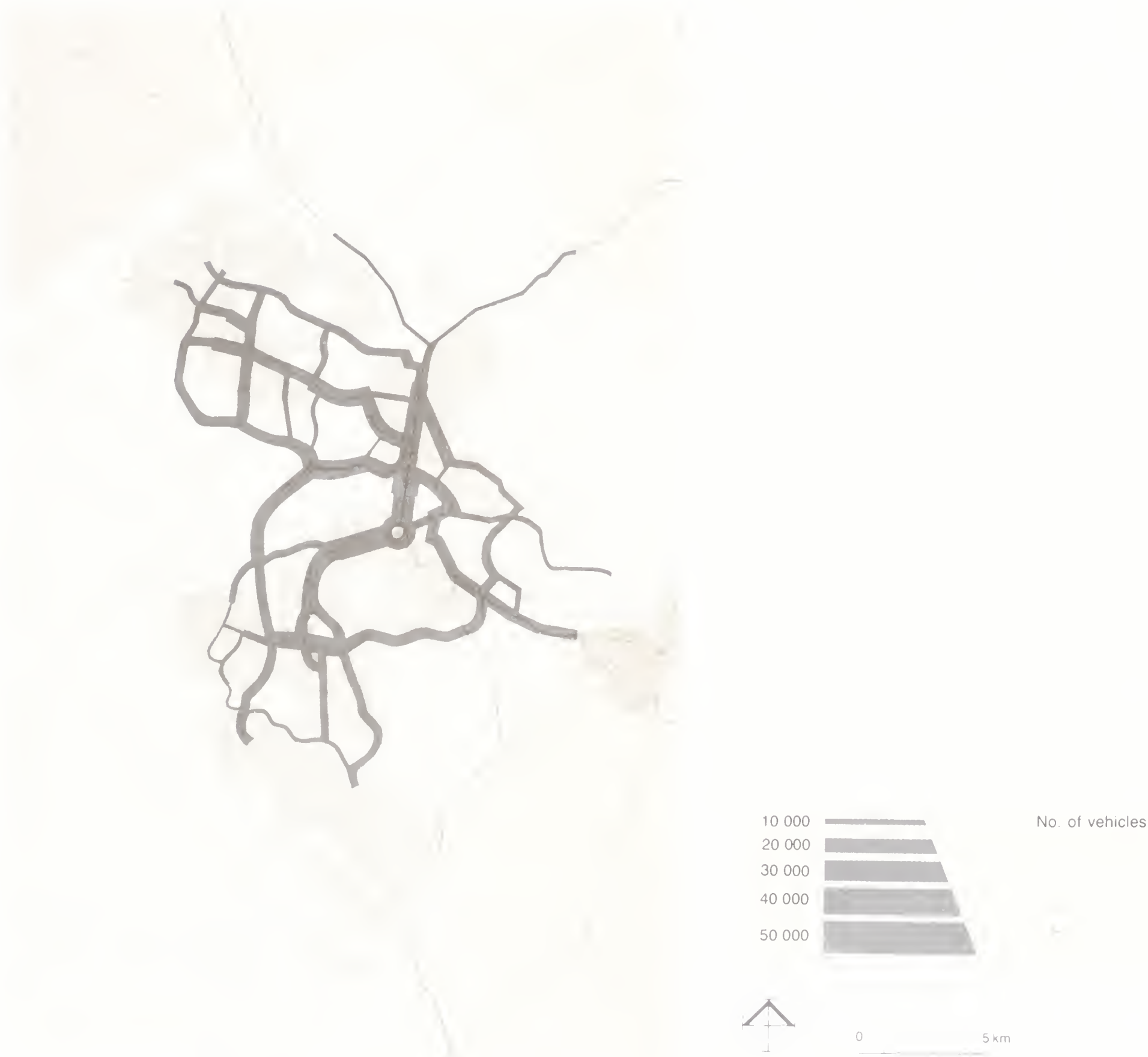


Figure 38 Average Daily Traffic Flows - 1982

- closely spaced intersections and other property access roads
- heavy conflicting pedestrian movements
- circulating traffic looking for parking spaces.

Growth of Civic, in terms of employment opportunities and retail floorspace, will exacerbate problems in the absence of new road capacity or policies to reduce traffic demand. A computerised traffic signal system is currently being installed to improve traffic flow. It will significantly improve the operating conditions of major roads, and access to and from the City Bus Interchange. However, only a minimal increase in traffic capacity is expected.

There are currently no major traffic congestion problems in the other town centres, although there are some local issues associated with inefficient signal operation and access to car parks.

Minor traffic congestion problems have been identified at Kingston and Manuka. These problems are primarily associated with on-street parking and vehicle interaction with pedestrian movements. In these areas little can be done without extensive redevelopment of the traffic circulation system or major investment in off-street parking. Either

Figure 39 Existing Traffic Congestion

alternative would result in major expense and an undesirable change in character. Currently, therefore, no action is contemplated.

Some of the roads which have been identified as part of the metropolitan road system have residential frontage and their traffic loadings are considered to exceed their environmental capacity. They are located in the older areas of Canberra and were not originally planned according to the principles of the road hierarchy. Examples of these roads include Limestone Avenue, Macarthur Avenue, Wakefield Avenue, etc. There are many other roads with similar, undesirable traffic volumes but these are not considered to have a metropolitan function, e.g. Kent Street, Stonehaven Crescent, Flinders Way, Cowper Street, etc. The Commission recognises the existence of these problems and is endeavouring to resolve them by upgrading appropriate elements in the metropolitan road system or employing traffic management techniques. In some cases it will not be possible to achieve a reduction in traffic. However, planning initiatives will be implemented to ensure that problems do not worsen.

Traffic Accidents

Traffic accidents appear to be highly correlated with the most heavily trafficked roads. The Commission maintains an extensive accident data base which is used to identify locations with a significant accident history, and establish appropriate design standards and solutions. Figure 40 identifies the most significant accident 'black spots' in the metropolitan area.

Road safety projects have a high priority in the Commission's road needs programme. Examples of recently completed safety-related projects include duplication of Hindmarsh Drive and roundabouts at several intersections on Erindale Drive.

Car Parking

Background

Until recently, the Commission had provided car parking spaces on a scale to meet the unrestrained demand for parking. Economic pressures in recent years have, however, had a considerable effect on the provision of parking facilities. During this period, scarce funds were allocated to major road and safety-related projects. The provision of parking was either deferred or provided at a reduced scale. Over the same period development has taken place on what were once car parking areas, thereby creating new and additional demands.

The relationship between parking demand and supply at the major employment and retail centres is shown in Table 45.

A potential undersupply has been identified at several major employment and retail centres. At present, any imbalance between supply and demand is overcome by the significant amount of informal parking which is provided on vacant development sites or areas identified for future landscape treatment. As new development takes place this parking resource is rapidly being diminished. This is particularly the case at Civic Centre and Woden Town Centre.

Pay parking has been implemented at Civic Centre, Woden Town Centre and Canberra Airport to ensure that short-stay parking is readily available. Pricing is carried out by boomgate, voucher and meter controls. Short-stay parking is generally provided within convenient walking distance of the desired location and at a scale needed to satisfy average daily peak demands. The critical peak demand for short-stay parking at retail centres occurs during Friday evenings or Saturday mornings when long-stay parking areas are also available for use by shoppers.

The Commission and the Department of Territories and Local Government are currently reviewing the policies in regard to parking. Some options which are being considered include:

- the introduction of long-stay parking charges to modify parking demand and assist in the financing of new facilities. The potential implications for public transport operations and the effect on adjacent residential areas would have to be carefully evaluated. It may also have significant effect on the commercial viability of particular areas
- revision of lease conditions so that future developers must provide an adequate supply of parking to suit their potential demands. However, the majority of new developments would require parking structures as land for surface parking may not be available. The cost of these parking structures may discourage new development.

Parking in Civic Centre

The current demand for long-stay parking in Civic (excluding Braddon) is greater than the ‘formal’ supply. The shortage is taken up by abuse of short-stay parking controls and informal parking on



Figure 40 Locations with High Accident Rates

open space or land identified for future development. Intrusion into nearby residential areas is also increasing.

Current development activity has resulted in a substantial parking imbalance, especially in City West. New developments which have had an effect on parking include:

- the recent completion of Jolimont Centre
- the development of new office blocks
- conversion of long-stay parking to boomgate short-stay parking.

The situation is exacerbated because land suitable for surface parking is becoming very scarce and proposed future developments will reduce the available land even further. New development proposals confirmed or planned within the next 10 to 12 years are expected to have the following impacts:

- it is estimated that up to 8 000 new jobs and 15 000 square metres of retail floorspace will be created
- the new developments will displace approximately 2 500 existing car spaces
- the new development will generate new demand, estimated at approximately 5 500 additional car spaces, thus adding to existing pressures
- if additional surface parking is not provided, car parking structures on existing surface parking areas will be necessary to accommodate the anticipated demand. It is estimated that a further 4 200 existing spaces could be displaced.

Up to 9 500 car spaces in structures could, therefore, be required within this period. The first parking structure will be constructed within the next two to three years to relieve existing parking pressures.

The current supply of short-stay parking is considered to be adequate for existing and short-term future average daily demands. It has recently been increased by the installation of new boomgate areas on London Circuit. Some problems have previously been observed during the lunch time peak period and at other periods of high retail activity (e.g. Christmas and Easter).

Table 45 Existing Parking Situation - 1982

Location	Employment	Parking Demand				Parking Supply		
		Retail Floor-space (m ²)	Long-Stay	Short-Stay	Total	Long-Stay	Short-Stay	Total
Civic Centre								
• City Division	14000	52800	8200	1350-1850	9550-10050	7250	2650	9900
• Braddon Service Trades	2000	7950	1400	200-360	1600-1760	1360	420	1780
Woden Town Centre								
• Retail/Office Core	8000	47750	4400	1230-1750	5630-6150	3500	1650	5150
• Phillip Service Trades	1300	20150	1000	500-700	1500-1700	2290	60	2350
Belconnen Town Centre								
• Retail/Office Core	6800	49100	3950	1230-1720	5180-5670	6050	160	6210
• Belconnen Service Trades	1200	16450	1050	410-580	1450-1630	2490	510	3000
Parkes	6150	-	3530	-	3530	3600	200	3800
Barton	4500	-	3100	-	3100	3340	120	3460
Russell	4700	-	2920	-	2920	2060	100	2160
Campbell Park	1900	-	1250	-	1250	1200	40	1240
Kingston Group Centre	600	16100	420	400-560	820-980	410	310	720
Manuka Group Centre	900	8450	610	340-380	950-990	360	340	700

Notes:

1. Long-stay supply in Belconnen Town Centre includes car parking structures.
2. Long-stay supply in major employment centres includes some informal and temporary parking areas.

An increase in short stay parking and improved enforcement of parking regulations are expected to overcome the existing shortage.

Parking in Braddon

Demand for parking in the commercial and service trades area of Braddon is currently in balance with the formal supply. There are, however, some local imbalances, necessitating longer walking distances. Parking pressures are not as great as in the retail and office core because of the lower density of development and significant amount of private parking available. Any new high intensity development could, however, result in major parking problems for Braddon.

Parking in Woden Town Centre

Woden is currently experiencing similar parking problems to those of Civic. The existing parking demand exceeds the current formal supply. The shortfall is made up by informal parking and land suitable for surface parking is almost completely exhausted.

Developments proposed in the short term will displace only a few of the existing parking spaces. However, these developments will add to the pressure by the increasing demand for parking.

Future development proposals within the existing core of the Woden Town Centre would displace existing car parking and generate an immediate need for parking structures.

There are limited opportunities for higher intensity development in the service trades area. Most of the land is already leased or developed and it is estimated that a single large office complex would consume most of the existing reserve parking capacity. Improved public transport facilities would also be required if higher intensity development occurred in the service trades area.

Parking in Belconnen Town Centre

It is generally acknowledged that there is an oversupply of parking in the Belconnen Town Centre. There is a generous provision at the existing office complexes due to their relatively low employment density.

There is also a generous provision at the retail mall because:

- structures were provided so that they could be converted to retail development, if necessary
- the scale of parking provided was based on projected demand. These were related to higher population projections for Belconnen and more intense office development.

A substantial amount of open space has been provided in the town centre. The open space and undeveloped development sites also provide attractive parking areas.

No parking problems are anticipated in the Belconnen Town Centre for the immediate future.

Parking at Major Employment Areas

While the parking supply at Campbell Park is generally considered to be sufficient to accommodate current demands, parking problems have been identified at Parkes, Barton and Russell. However, adequate parking is available at slightly greater walking distances in some locations and many drivers take advantage of the large amount of informal parking which is quite often more convenient.

Parking at Secondary Level Retail Centres

The parking supply at most existing group centres is considered satisfactory. It generally meets the average weekly peak demands. However, there are occasions when supply may be exceeded for short periods. This situation is considered to provide the most economic and efficient use of available resources and is common to most retail centres.

At both Kingston and Manuka, average daily parking demands usually exceed the formal parking supply. Most of the shortfall is accommodated in nearby residential streets. Recent redevelopment has had a considerable impact on the parking situation. New speciality stores and other high traffic generating developments such as restaurants and bars have been constructed in the commercial core. Office, commercial and medium-density housing development has occurred in what were previously low-density residential areas. This development has significantly increased the demand for parking. Parking and circulation problems are further exacerbated because a major proportion of the parking is provided on-street.

Public Transport

Background

The past two or three decades have seen a marked change in public transport. Historically, the provision of public transport services was economically profitable and cheap travel could be provided. The rapid increase in ownership and use of private motor vehicles has resulted in improved accessibility over a much wider area than can be matched by improved public transport operations. This has encouraged land use patterns where access to jobs and services are more difficult for people without cars. Overall the effect has been to reduce the growth in patronage and increase the cost of public transport operations.

Nonetheless, public transport has an essential role to play. It is the primary source of mobility for those who for reasons such as health, age or income cannot use or do not have access to a motor car. Under certain circumstances public transport increases overall transport efficiency by minimising land take for roads and car parks, and by conserving energy and reducing fuel consumption. However, such efficiencies can only be fully realised where passenger loadings are high. Additional improvements to road safety can also be achieved where there is a substantial transfer from private to public transport. Furthermore, public transport is considered to have a less damaging effect on the environment.

Since public transport provides an essential social and community service, it is considered desirable that it should be encouraged by policy decisions which promote its use. It is also considered essential that a suitable standard of public transport be provided for that sector of the community that is wholly dependent on it, and that it be promoted where it can be demonstrated as providing more efficient use of available transport resources. This will necessitate some public expense (subsidy) since the measure of success is no longer profitability but rather the satisfaction of a number of social objectives.

The Existing Public Transport System

Public transport within the metropolitan area consists of taxis and buses.

Taxis

Taxis account for approximately 0.4 per cent of the average daily transport needs. However, they do perform an important metropolitan function in that they supplement the bus system during the evenings and weekends when other public transport services are limited or non-

existent and provide a demand responsive service. The current taxi fleet in Canberra is privately operated and consists of 117 vehicles.

The Bus System

The responsibility for operating and managing the metropolitan bus system (ACTION) lies with the Department of Territories and Local Government.

The Department's public transport strategy is based on a line-haul and feeder concept. In this strategy, local bus services, or feeders, provide a basic transport service between each suburb and the closest town centre. High speed express buses provide a line-haul service between the centres.

Special purpose public transport interchanges at each of the town centres are an important part of the strategy. They provide a convenient focus or point of concentration for all the bus routes, enabling the efficient transfer of passengers and synchronisation of bus operations. During the peaks, most interchanging passengers are able to alight from one bus and immediately board another. The public transport interchanges are also an integral part of the town centres and, because they are centrally located, provide maximum convenience to terminating passengers, i.e. those who work or have personal business at the centre.

The line-haul strategy is particularly suited to Canberra's land use distribution and hierarchical road system. The urban structure of Canberra consists of several towns with centres which are separated by relatively long distances. This enables a line-haul service to be operated efficiently. The major advantages of the strategy are considered to be:

a) for the passenger:

- higher frequency of service
- reduced journey times for most journeys
- greater choice in number of destinations
- improved reliability and schedules
- passenger amenities at interchanges

b) for the operator:

- improved efficiency through higher operating speeds, minimising unproductive travel and higher numbers of passengers per kilometre travelled
- improved control and co-ordination of services
- improved driver amenities.

The main disadvantage is that most passengers have to interchange involving inconvenience and usually extra cost.

Bus Operations

The existing bus network is shown in Figure 41. It consists of about 70 routes and covers approximately 800 route kilometres.

The inter-town express (line-haul) services travel on the most direct routes between town centres. Supplementary express services are provided between the Woden and Belconnen Town Centres and major employment centres at Campbell Park, Russell and Parkes Barton during the peak hours to accommodate the high commuter demands. During the peak hour, express buses operate every six to seven minutes, whereas, off-peak, the frequency is every fifteen minutes.

Each suburb in Canberra is serviced by at least one local bus route (feeders). The routes are selected so that most residents have less than a 400 m walk to a bus stop. However, bus routes are subject to specific

design considerations which may affect the maximum walking distance criterion. They include:

- a minimum street pavement width of 10 m
- heavy duty pavements
- maximum grades of about 8 per cent.

Generally, local bus services are provided every fifteen minutes during the peak, with thirty minute frequencies during the off-peak and sixty minute frequencies on evenings and weekends.

ACTION has introduced other innovations to try to improve the standard of service and efficiency. These include:

- a fare box system to reduce boarding time
- articulated buses
- advanced purchase tickets
- zonal fare structure, involving a single fare for any part of a single zone
- area bus operations for after hours services.



Figure 41 Existing Bus System

Demand for Public Transport

It is estimated that Canberra's bus system **satisfies** for about **8-10** per cent of the average daily travel demand.

Annual bus patronage in 1982-83 was approximately **20 million** passenger trips. This represents approximately 14.3 million individual journeys. Bus patronage has increased steadily (excluding effects of population increases) since about 1976. Table 46 shows the relative increases over the period 1975-76 to 1981-82. The 1981-82 figures are not considered to be representative, because of major industrial action during that year. Most of the increase in patronage is due to natural growth (population increase) and restructuring of services (some people who previously made one trip per journey, now make two). However, a significant proportion of the increased patronage is due to the improvements to services introduced over that period. These include higher frequencies, advance purchase of tickets, synchronisation at the bus interchanges and supplementary peak-hour services.

Table 46 ACTION Annual Passenger Trips - 1976-1982

	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Special School Services (000s)	-	-	-	-	3 266.6	3 417	3 600
Scheduled Route Services (000s)	-	-	-	-	15 233.4	16 383	13 947
Total (000s)	11 400	12 355	13 874	16 240	18 500	19 800	17 547
% Increase/Year	-	8.4	12.3	17.0	13.9	7.0	-12.8(1)
% Population Increase	7.0	3.2	3.0	1.9	2.0	1.3	1.5

(1) Large proportion of reduced patronage due to substantial industrial stoppages, but previous years suggest the rate of increase was falling off.
(Source: DCT Annual Reports).

Table 47 Distribution of Bus Travellers by Purpose - 1975 (%)

Purpose	%
Home-Based Work	27.2
Home-Based Education	44.0
Home-Based Shopping	9.6
Home-Based Other	8.3
Not Home-Based	10.9
Total	100.0

(Source: 1975 Home Interview Data Base)

More than 70 per cent of bus travel is related to school and work trips, as indicated in Table 47. Special school bus services accommodate about 50 per cent of daily school bus trips, while the remainder are catered for by the normal scheduled services. It is estimated that up to 35 per cent of daily bus use occurs during a two hour period in the a.m. peak. A similar amount is carried over about three hours during the p.m. peak period.

It is also estimated that about 20 per cent of daily bus travel occurs during the critical peak hour (a.m.). During this time, express bus services are operating at about 95 to 115 per cent of seated capacity (seated capacity is about two-thirds of 'crush capacity'). However, most feeder services are operating at less than 60 per cent of seated capacity. In the off-peak period most buses operate at a fraction of their capacity (estimated at 10 to 15 per cent on average).

Public Transport Operating Costs

Over the past decade, the annual bus operating deficit has increased substantially. Table 48 shows that the increase in the annual deficit was greater than the annual rate of inflation for the same period.

Table 48 Public Transport Operating Costs, Revenue and Annual Subsidy - 1976-1982

	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Operating Costs (\$000s)	6 997	8 496	10 630	12 608	15 728	19 589	21 309
Revenue (\$000s)	2 939	3 583	4 357	4 875	5 619	7 828	8 788
Annual Deficit (\$000s) (1)	4 058	5 363	6 273	7 733	10 109	11 761	12 521
Annual Rate of Increase of Deficit (%)	-	32.1	17.0	23.3	30.7	16.3	6.5

(1) Equivalent to Subsidy
(Source: DCT Annual Reports)

It is notable that other government operated public transport services throughout Australia have similar operating deficits, and attract government subsidy. Table 49 shows the annual deficit for each Australian Capital City for the financial year 1979-80.

Table 49 Urban Public Transport Performance - 1980 (1)

City	Type	Deficit (2) (\$ millions)	Passengers (millions)	Deficit per Passenger	
				Each Type (\$)	System-Wide (\$)
Sydney	Rail	132.4	205.0	.65	.52
	Bus	73.5	194.4	.38	
Melbourne	Rail	62.0(3)	85.8	.72	.50
	Tram	29.1(3)	98.9	.29	
	Bus	11.7(3)	19.9	.59	
Brisbane	Rail	43.1(4)	28.0	1.54	.79
	Bus	15.8	46.4	.34	
Adelaide	Rail	17.2(4)	13.8	1.25	.59
	Bus	27.7(4)	61.0	.45	
	Tram	0.8(4)	2.7	.30	
Perth	Rail	10.5	7.1	1.47	.60
	Bus	27.6	56.3	.49	
Canberra	Bus	10.1	19.5	.52	.52
Hobart	Bus	5.8	12.6	.46	.46

- (1) Government-operated systems only, for financial year 1979-80.
(2) Deficit includes interest, depreciation and government reimbursements.
(3) Scholar and pensioner reimbursements estimated.
(4) Interest and depreciation charges estimated.
(Source: Respective State Authorities and Annual Reports)

It should be recognised that it is not possible to provide the level of service demanded by the community on a 'break-even' basis. The fleet size is determined by the peak-hour operation and for most of the day is not used efficiently or remains idle. Weekend and evening operations attract penalty wage rates, but only a few patrons, and students, pensioners and children are carried at reduced fares.

The general indications are that the annual deficit will continue to increase at a rate greater than the rate of inflation. The main reasons are:

- increasing running costs (fuel, spare parts, tyres)
- increasing wages
- Canberra's growing population and expanding urban area will require a larger fleet, which because of the inherent uneconomic nature of peak and off-peak loadings will be idle most of the time.

Future Travel Patterns - Trends and Implications

Background

The existing planning of Canberra has been determined, to a large extent, by previous actions and community desire to retain the current lifestyle and standard of amenity. Future planning strategies are discussed in detail in Chapter 5. Some of the basic elements which will have a major impact on the planning for future transport facilities are:

- within the planning period, the population of Canberra/Queanbeyan will grow to about 410 000
- there will be continued population settlement in Tuggeranong to an eventual population exceeding 85 000 persons

- population settlement will occur in Gungahlin, leading to an eventual population of approximately 84 000 people.

The proposed population settlement strategy takes advantage of the extensive capital investment to date in roads, hydraulic works, major electrical infrastructure, etc., and although it recognises the increasing economic pressure for higher-density living, it acknowledges the fact that it will probably have minimum impact on the overall density. This means that when Canberra's population reaches 400 000, the residential density will be about the same as it is now, i.e. approximately 16.5 persons/ha. Planning for Canberra's future needs has, therefore, continued to be based on servicing a widely-spread, low density city.

Future Trip Generation

Travel demands over the next twenty years are expected to be similar to those which currently exist.

There may be a slight reduction in average daily trip generation from about 4.1 trips per person per day to about 3.9 trips per person per day. There is evidence of a reduction in discretionary travel (shopping, social, recreation, etc.) over the past decade and this trend is expected to continue. Some trips are no longer made and some have been combined with other trip purposes, (e.g. a shopping trip on the way home from work). The increasing cost of travel is considered to be the main reason for the reduction in trip generation. The increasing average age of Canberra's population is also believed to have some effect.

It is the peak period which is the major determinant affecting the provision of facilities for either public or private transport. There is unlikely to be any change which could significantly affect peak-hour travel demand. More than 75 per cent of morning peak-hour trips are currently concerned with travel to work or school. This situation is expected to be the same in the future.

Future Mode Split

Predicting the mode choice of future travel demands is difficult, due to the complex interaction of many variables. Some of the most important factors that will influence the amount of travel by public transport are:

- layout of the City, including the location and intensity of activity centres, and the population density
- proportion of community which is captive to public transport
- efficiency, availability and relative cost of travel
- supply and cost of parking available for private cars
- availability of fuel for private cars
- improved public transport services
- ability to provide low cost public transport facilities.

The future planning strategy can be viewed as an extension of the existing City, the residents of which will probably retain their transport-intensive lifestyle. Private car travel is currently the main mode of transport and accounts for about 90 per cent of daily vehicular travel. Bus travel, on the other hand, caters for less than 9 per cent (the remainder are taxis and motorcycles).

Any significant increase in average journey travel time resulting from an increase in the size of the City is predicted to have an adverse reaction on the relative proportion of travellers using public transport.

It is estimated that up to 88 per cent of public transport trips (excluding school children) were made by travellers with no alternative

form of transport available for that trip, that is, they were captive to public transport.

Of those passengers who actually chose to travel by public transport, the journey to work currently accounts for the highest proportion by journey type, and shopping trips the lowest, (19 per cent and 2.5 per cent respectively). Commuter travel by public transport is expected to increase significantly to the town centres due to parking controls (reduced availability or higher cost), and shopping journeys by bus may decrease if trip lengths and car availability increase. Little change is expected for other journey purposes.

Increasing motoring costs (excluding parking charges) relative to public transport fares are not expected to have a significant effect on mode split. In recent years motoring costs have increased dramatically while public transport fares have reduced in 'real terms', with little apparent change in car usage. The large increase in fuel costs (since 1975), however, appears to have resulted in a change to smaller, more fuel-efficient cars. Reducing public transport fares is also not expected to change the situation significantly. Research indicates the 'price elasticity of demand' for public transport is about -0.3 (i.e. a 10 per cent reduction in fares would achieve a 3 per cent increase in ridership), and that most of any increase is due to existing captive users making greater use of cheaper transport, and greater use by travellers who would otherwise be car passengers (as opposed to drivers).

The future introduction of parking charges for long-stay parking is considered to have the potential for the most significant increase in public transport use. However, parking charges can be realistically applied only where supply, relative to demand, is limited, and then, only if suitable alternative transport is available. The town centres are thought to be the only reasonable application for this type of policy.

The past rate of increase in ACTION's annual operating subsidy and the forecast that it will continue to increase faster than inflation, indicate that low cost public transport is not possible in the foreseeable future.

The increase in public transport usage in Canberra over the past seven years is atypical. Elsewhere in Australia, and throughout the world, patronage levels have declined. Most of the increase in Canberra was due to major service improvements over the period. In view of the likelihood of increasing public transport costs generally, and considering the possible development strategies for Canberra, it is anticipated that the average proportion of travel catered for by public transport will remain about the same (8 to 10 per cent of all vehicular trips). This implies an increase in public transport travel of approximately 56 per cent due to population growth. A significant distributional change is forecast for peak hour travel. Mode split to the existing town centres is expected to increase although the amount will depend on the density of town centre development, the successful introduction of a pay parking strategy at major centres and public acceptance of a substantial increase in the cost of operating the public transport system. In the transport evaluation in Chapter 5, estimates have been made of the maximum likely increase in mode split.

Water Resources and Energy Services

Water Resources

Introduction

The water resources of the ACT are limited in terms of their capacity to supply water and assimilate wastes consistent with the protection of recreational use and the environmental quality expectations of the community. There is, therefore, a need to allocate the resource across a number of competing demands.

Decisions on land use and its management are the principal determinants of both the nature of water use demands placed on lakes and streams of the region, and of the ability of the lakes and streams to sustain the uses. Accordingly, decisions on land use need to be considered in the context of their implications for existing water uses and associated land uses in the basin.

Allocation of Water Resources

The ACT Water Use Policy Plan provides a comprehensive statement of the allocation of water resources (in quality and quantity terms) of the ACT across the competing uses. It also provides a brief description of the water resources of the region, obligations in respect of protecting the rights of downstream users, and the location of such key uses as diversion for water supply, wastewater and stormwater discharges, recreation, and areas of aquatic habitat of regional significance.

It provides the basis for an assessment of the implications of land use changes and infrastructure proposals for existing water uses and associated land uses in the basin.

Water Resources Management and Current Issues

A range of management and infrastructure strategies have been adopted as the means of providing the services and conditions to meet community aspirations. The management strategies comprise:

- land use and management control, which is cognisant of the protection of water and associated land uses downstream
- the provision of water supply, wastewater, and surface water management infrastructure
- the management of demands for services by means of siting controls, water supply and wastewater discharge tariffs, and regulations.

The principal infrastructure components comprise:

- municipal water supply, including potable and second class (irrigation) water supply systems
- wastewater management, including the provision of sewerage and industrial wastewater management schemes
- surface water management, including the provision of urban lakes, water quality control ponds, stormwater drainage, and flood control.

The following factors are currently, or may in future become, significant issues in relation to water resources:

- the requirement to augment water supply to meet growth in demands associated with metropolitan growth
- the limited extent of the ACT water resources in relation to the ability to meet future water supply demands and environmental protection expectations
- the exacerbation of water quality problems in lakes and streams

as a result of stream diversion (principally the Queanbeyan River at Googong) for water supply

- the high cost of wastewater treatment associated with the level of protection of environmental and recreational amenity of inland lakes and streams expected by the community
- the demands for water-based and related recreation, and the limited capacity of natural and constructed facilities to accommodate these demands
- an expectation that water features will be provided and managed in a manner consistent with facilitating a wide range of recreational uses
- the requirement to contain urban runoff pollution in order to protect the environmental quality and recreational amenity of the Murrumbidgee River through Tuggeranong, and Ginninderra Creek downstream of Gungahlin
- the expectation of the retention of natural channels and ecosystems within the urban environment, and the associated problems of managing surface runoff consistent with the protection of property and recreational amenity
- the requirement for the provision of higher levels of water treatment of Cotter water in view of the increased recreational pressure on the Cotter catchment
- the cost of replacing ageing infrastructure.

Current Patterns of Demand and Service

Water Supply

The management of water supply comprises the provision of a supply upon demand (municipal water supply), the conservation of water through the recycling of sewage effluent and urban runoff for irrigation purposes, the management of demand through water tariffs and the use of native plants for landscape purposes, and the application of water restrictions in periods of drought.

Canberra and Queanbeyan are supplied with water from three dams on the Cotter River and one at Googong on the Queanbeyan River. Total dam capacity is adequate to cope with a Canberra-Queanbeyan population of 450 000 at current levels of consumption. ACT water consumption per head of population (680 litres per person per day) is relatively static, subject only to short-term variations reflecting seasonal conditions.

A high proportion of ACT water consumption is used for watering parks and domestic gardens (55 per cent of total consumption as a long-term average). Recycling of wastewater and urban runoff for the irrigation of parks and gardens, and the adoption of landscape forms which have a reduced watering requirement, offer potential savings in the cost of water supply.

Wastewater

The management of wastewater comprises the provision of collection and disposal (sewerage) services upon demand (including the provision of wastewater treatment facilities), the conservation of wastewater through recycling of sewage effluent for irrigation purposes, the management of demand through charges for discharge to sewers, and regulations controlling discharges to streams and sewers.

Urban areas in Canberra are fully sewered. The Lower Molonglo Water Quality Control Centre (LMWQCC) treats all of Canberra's sewage, and has a capacity to service a population of 400 000. The timing of augmentation will be dependent on population growth and the amount of waste generated by each household.

Water pollution control legislation will necessitate the commissioning of all wastewater discharges to the sewerage system, the upgrading of the level of treatment provided at the Cotter and Home Sewage Treatment Works, and the provision of sewers to cater for industrial discharges.

In addition, replacement of the Molonglo Outfall Sewer constructed in 1918 and the progressive construction of trunk sewers in Tuggeranong and Gungahlin will be required over the next ten to fifteen years.

The design capacity of existing sewers is exceeded in some areas, resulting in periodic spills of sewage to local lakes and streams. Where the potential risk to public health is high, augmentation will be required.

Surface Water

Surface water management comprises the provision of collection and disposal (stormwater) services upon demand (including the provision of water pollution control facilities), the establishment of urban water features in response to recreation and landscape demands, the conservation of urban runoff through recycling for irrigation purposes, the management of demand through design and siting of urban development and zoning of water uses, and restrictions controlling land use in flood plains.

Urbanisation causes a fivefold to sixfold increase in peak runoff generated by storms, and consequently a need to augment the capacity of natural channels to transfer these peaks safely out of the urban area, or to store the stormwater in the floodways, retarding ponds, and in the ground storage systems.

The stormwater drainage system, which is separate from the sewerage system, comprises pipe drains, stormwater channels and retarding basins which complement the creek and river system. Lakes and water quality control ponds are employed to protect receiving waters.

Urban stormwater is a source of pollutants which may impact on the water quality of local lakes and streams. Current design of stormwater systems seeks to incorporate both the means for collecting and removing stormwater from the urban areas and of trapping pollutants carried in the stormwater. Much of the existing stormwater control infrastructure was constructed in the 1950s and 1960s without the benefit of present day knowledge. In these cases, corrective works will be required.

As with sewerage reticulation, progressive provision of main drains for stormwater will be required in Tuggeranong and Gungahlin over the next ten to fifteen years.

Future Demand Trends and Implications

Canberra's water consumption is high in comparison to Capital City standards. This is largely a reflection of Griffin's concept of Canberra as a 'garden city' and the inland location of Canberra. As the City grows, there will be a need to modify consumption patterns consistent with the available supply and the protection of water quality.

Wastewater volumes generated per household in Canberra are comparable to those of urban areas in Melbourne and Sydney. With a trend to increasing use of household appliances and a falling household occupancy rate, it is expected that a growth of 1 per cent in wastewater generation per person per annum will occur in the future. Experience gained in the commissioning of the Lower

Molonglo Water Quality Control Centre has validated the appropriateness of stringent standards controlling levels of nutrients in sewage effluent.

The pattern of increasing leisure time will yield further demands for water-based recreation facilities, and reinforce the importance of protection of water quality of lakes and streams of the region.

Energy Services

Solar Energy

A number of swimming pool solar heating systems have been installed by the Commission as a means of reducing energy consumption costs and as a basis for the evaluation of solar heating systems. Increasing use is being made of solar hot water installations for domestic purposes.

Solid (Wood) Fuels

There has been a trend to the use of wood burning heaters in domestic dwellings in Canberra in recent years. The trend raises concerns in respect to environmental (air pollution) implications of the emission of wastes from this source.

Electricity

The installation and augmentation of electricity services is carried out by the ACT Electricity Authority (ACTEA), in conjunction with the Commission. The Commission's aim in the planning for electrical supplies is to provide reservations for transmission lines and reserve sites for substations which meet the needs of ACTEA for an economic and reliable distribution system, consistent with the protection of the environment of Canberra and the visual setting of the ACT.

Electrical power is supplied to the Territory primarily via a 330 kV system, which feeds the Canberra 330/132 kV substation at Holt. A secondary 66 kV supply is provided to the Kingston substation from the NSW 132/66 kV substation at Queanbeyan. This secondary supply will be phased out in the near future.

Power is transmitted from the supply points, via a 132 kV sub-transmission system, to substations throughout the metropolitan area. Power from these 132/11 kV substations is then transmitted via 11 kV lines to local transformers within the suburbs or centres where the voltage is further reduced for supply to users.

Natural Gas

Natural gas is distributed in the ACT by the Australian Gas Light Company. The natural gas comes from Moomba gas fields in South Australia and is supplied to the ACT through a high pressure pipeline extending from the Moomba to Sydney pipeline.

The Australian Gas Light Company receives the gas at a trunk receiving station in Gungahlin. The gas is reticulated through a network of steel mains to major commercial and industrial consumers. The network also supplies gas to district regulators which are located throughout Canberra to service the various residential areas.

The Commission began a programme in 1980-81 which identified 185 government buildings suitable for conversion to natural gas. Installation of systems for the conversion of the first public buildings in the ACT to use natural gas (the Royal Canberra, Woden Valley and Calvary Hospitals) was completed in January 1982. Since then, the Russell Defence Offices, Cameron Offices and a number of Canberra schools have been changed over.

Physical and Environmental Aspects of the City

Environment

Introduction

From a metropolitan perspective, the following environmental factors are important when preparing a long range policy plan for Canberra:

- water quality
- air quality
- noise quality in the urban environment
- ecological resources.

It is recognised that increased population, urbanisation and potential industrialisation will place growing pressure on the finely balanced and limited assimilative capacity of the environment and on the finite stock of natural resources. The Commission's broad environmental aim is to ensure that future development in the ACT is in harmony with the general environment and within the requirements of the *Environment Protection (Impact of Proposals) Act 1974*. This section examines the existing environment from the point of view of the environmental factors noted above (see Figure 42).

Water Quality

It is essential that the water quality of lakes, rivers and streams within the ACT is adequate for community uses such as domestic water supply, recreation, irrigation and stock water supply, angling and maintenance of significant aquatic habitats.

While pollution of aquatic systems can arise from land used for grazing, agriculture, forestry or nature conservation, under normal conditions, effluent from sewage treatment works and urban storm-water runoff are responsible for the major part of pollutant loadings.

In July 1978, the LMWQCC commenced operation, enabling the Weston Creek Sewage Treatment Works to close in September 1978 and the diversion of sewage from the Belconnen Water Pollution Control Centre, as of October 1979. These actions have caused a dramatic improvement in the water quality in parts of the Molonglo and Murrumbidgee Rivers and Ginninderra Creek, even though the detailed interpretation of the extensive monitoring data collected since that time has been complicated by the fact that, from late 1978 to early 1983, the region experienced a period of severe drought.

There is increasing evidence that, in recent times, parts of Lake Burley Griffin have been exhibiting considerable water quality stress, due to very low flows into the lake and high nutrient loadings from urban runoff and the Queanbeyan sewage treatment works. Even though the ameliorative works at Captains Flat have reduced the threat of zinc pollution in Lake Burley Griffin, the biological character of the Molonglo River has shown limited improvement. Lake Ginninderra has continued to maintain a higher quality than Lake Burley Griffin.

Overall, the water quality of the Murrumbidgee River, from Angle Crossing to the confluence of the Molonglo River, is generally of high quality, suitable for body contact recreation and irrigation, and supports a diverse range of fauna, even though there are observed impacts associated with urban runoff from Tuggeranong.

In summary, when the LMWQCC is operating at its maximum level of performance, the impact on the environment from sewage

in the Canberra region is virtually eliminated. However, periods of water pollution are still occurring in parts of Lake Burley Griffin and the Molonglo River, due to increasing urban runoff from Canberra and Queanbeyan, continuing pollution from Captains Flat and effluent discharge from the Queanbeyan sewage treatment works. In these areas, the main water quality concerns are associated with excess nutrients (phosphorus and nitrogen) and their subsequent effects on plant growth and/or with bacteria from sewage spills.

Air Quality

The major aim, in terms of metropolitan planning, is to ensure that air pollutants do not exceed levels at which they can have identifiable health effects. In the ACT this is a significant issue, as Canberra has a high potential to accumulate air pollutants because of the high percentage of calms or periods of low wind speed and frequent temperature inversions.

The major source of air pollution is associated with emissions from motor vehicles. Such emissions are high in areas of traffic congestion, particularly if this is concentrated in one central business district.



Figure 42 Existing Environmental Conditions

Intermittent monitoring since 1974 has found that, while World Health Organization air quality standards have been reached or exceeded in Civic for carbon monoxide and ozone on a few occasions, there are no indications that there has been a marked deterioration in Canberra's air quality over this period. These observations support the Commission's planning philosophy of creating an efficient public transport and road system, decentralising employment and discouraging through-traffic movement in centres.

Overall, these measures have resulted in a reduction in the extent of traffic congestion and travel distance and time which, in turn, have reduced air pollution by reducing the amount of vehicle emission and/or dispersing them over a wide area.

Recent monitoring activities by the Capital Territory Health Commission, as part of an Australia-wide survey of lead levels in urban airsheds, has found lead levels in Civic Centre and the Woden and Belconnen Town Centres which exceed National Health and Medical Research Council standards.

Noise Quality in the Urban Environment

Noise is one of the many problems which occur in the urban environment. Research has shown that, within urban areas, excessive noise has a detrimental effect on the quality of life in the community.

As a result of careful planning, the impact of noise on Canberra's urban environment has been significantly reduced. Major traffic routes have been located away from residential areas or adequate set-backs from arterial roads have been provided, and residential areas have been arranged so that through-traffic is discouraged or eliminated.

However, recent studies have shown that parts of Inner Canberra are experiencing high noise levels, caused by through-traffic using residential roads to travel to Civic. There is also evidence of extensive parking in residential streets surrounding Civic, with the resultant increase in vehicles in these areas.

Ecological Resources

From a metropolitan viewpoint one of the key environmental issues is to ensure adequate environmental protection and conservation of significant ecological resources. Four categories of ecological resources have been recognised:

- large natural bushland areas in the southern and western parts of the ACT
- areas and sites of ecological significance in the remainder of the ACT
- significant wildlife movement corridors
- arboreta and exotic plantings.

These categories and individual sites and areas are shown in Figure 43.

Large Natural Bushland Areas

These areas cover the Gudgenby, Gibraltar Creek, Tidbinbilla and Cotter areas which are major bushland environments surrounding the existing and future metropolitan area. While these large areas contain numerous smaller areas and sites of ecological significance, at the scale of the Metropolitan Policy Plan there is no point in evaluating individual sites. Rather, it is sufficient to recognise these areas in their entirety as ecological resources of outstanding significance and to develop appropriate broad policies for their protection and use.

Specific Areas and Sites

The areas in the north and east of the ACT which includes all of the existing urban areas, have been extensively modified by land use and contain only remnants of the original vegetation patterns. The areas shown on Figure 43 have significance as ecological resources mainly because they are the last remaining examples of formerly more-widely distributed plant communities and animal habitats. Many provide habitats for plants and animals which are now uncommon in the ACT, because their original habitats have been severely reduced in extent.

At present, the Commission is assigning ecological significance ratings to each of these areas, so that appropriate planning and management actions can be developed to ensure adequate protection of these areas.

Significant Wildlife Movement Corridors

These are zones or routes along which defined movements take place by certain native animal species.

Four major corridors have been identified: Lower Molonglo Valley, Upper Majura Valley, South Canberra Hills and Murrumbidgee River Valley. The first three of these are primarily kangaroo movement corridors, and the latter is a key bird and fish movement corridor.



Figure 43 Ecological Resources of the ACT



Figure 44 Topographical Limitations to Urban Expansion



Figure 45 Water Catchments and Nature Reserves

Arboreta and Exotic Plantings

There are three main types of ecological resource (other than artificial lakes, ponds and dams) which fall into this category of man-made ecosystems:

- pine plantations
- arboreta
- other exotic plantings.

While these resources do not have ecological value in the same sense as those ecological resources of natural origin, they nevertheless are of some ecological interest. Some forests such as the Stromlo-Green Hills area intrude into the view from the Central Area. Parts of the existing exotic forests may have to be re-established as indigenous landscapes if the National Capital Open Space System is to be extended and the visual backdrop to the City is to take the form of a landscape of Australian character. Other areas may be required to accommodate the extensive special purpose land uses which require non-urban locations close to Canberra.

Constraints to Development

Topographical Limitations

Of the 2 356 km² of the ACT, nearly 60 per cent is topographically unsuitable for urban development. The land is too steep, too rocky, or too broken (Figure 44). Much of it, however, is used for water catchment areas, nature reserves, the clearance zone for communications facilities and other appropriate uses.

The waters of Lake Burley Griffin and Lake Ginninderra and the flood plains of the Molonglo and Murrumbidgee Rivers cover another 26 km².

Water Catchment Areas

The Cotter River catchment covers an area of 483 km² of steep mountainous terrain, of which 470 km² is in the ACT. The Naas-Gudgenby River catchment has been identified as a possible future source of water supply, which may be required when the Cotter and the Googong system reach capacity at a Canberra-Queanbeyan population of 450 000. Although these catchments may be able to cope with recreational and other selected uses, it would not be appropriate for urban development to be located in these areas.

Nature Reserves

The Tidbinbilla Nature Reserve occupies 46 km² of the ACT. The Gudgenby Nature Reserve, which currently comprises 600 km² or over 25 per cent of the area of the ACT, is a large reserve used primarily for nature conservation and low intensity recreation.

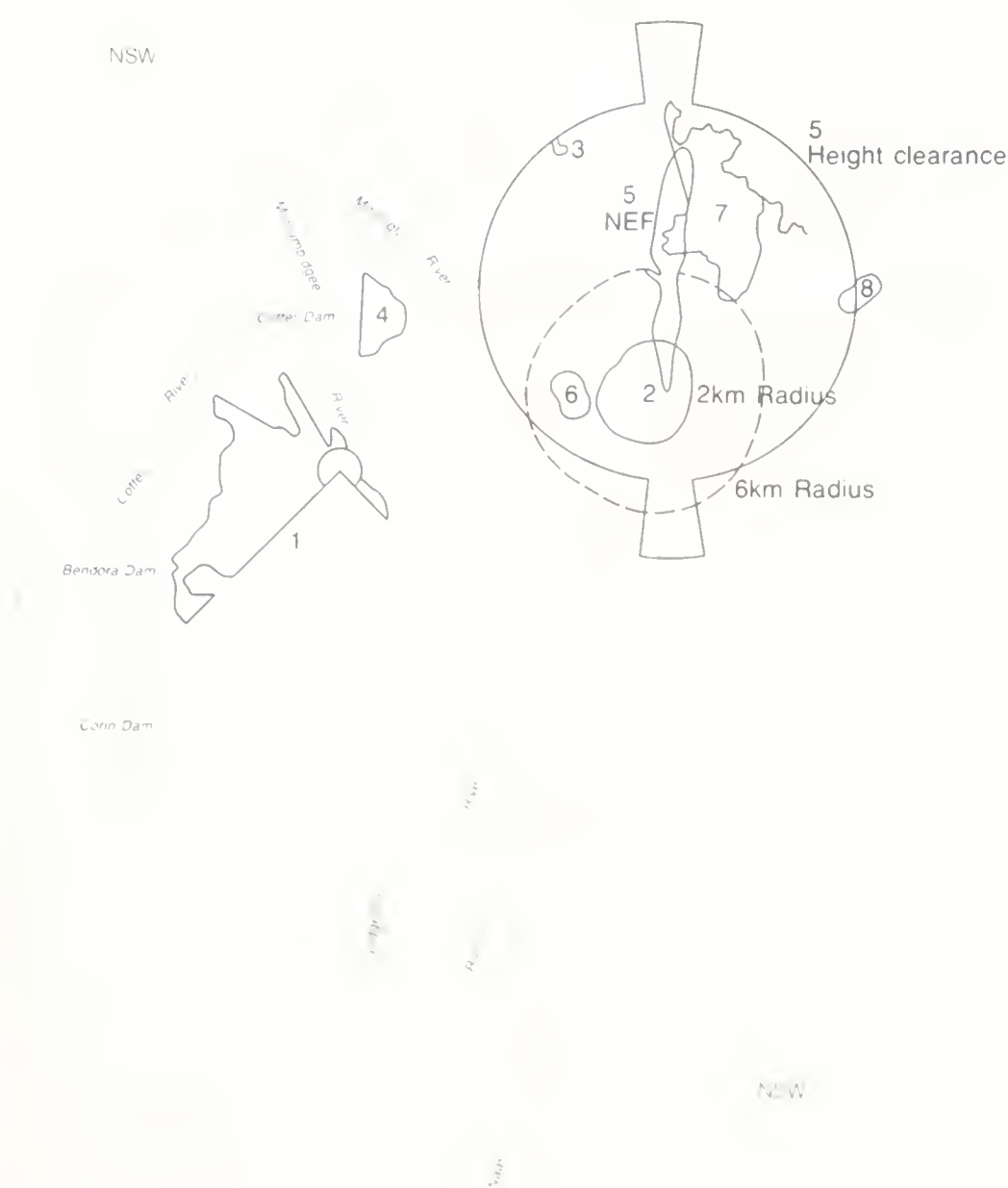
Smaller gazetted reserves which also have nature conservation and recreational roles include Black Mountain Reserve and Molonglo Gorge Reserve.

Because the primary land use in nature reserves is the conservation and public appreciation of native flora and fauna within their natural environment, these areas are unavailable for urban development.

Communications Installations

The ACT contains a number of communications installations which, to operate efficiently, require protection from the generated effects of urban settlement and associated development (Figure 46).

The Commonwealth has obligations to protect tracking stations from any electrical or other interference from urban settlement, power



- 1 Tidbinbilla Deep Space Communication Centre
- 2 Harman Bonshaw
- 3 RAAF Gungahlin
- 4 Mount Stromlo Observatory
- 5 Canberra Airport
- 6 Mugga Quarries
- 7 RMC Field Firing Range
- 8 Australian Federal Police



Figure 46 Protection Zones

transmission lines, radio transmitters or electrical, scientific, medical and industrial equipment.

Tidbinbilla Deep Space Communication Complex

Urban development near the facility is limited by the following zone constraints (Figure 47):

- Zone 'A' - no development is permitted within a 1.25 km radius from the centre of the complex
- Zone 'B' - no industrial development is permitted within a 3 km radius of the centre
- Zone 'C' - an arc from the north-west to the south-west which is modified by the terrain. Consultation is required prior to development by any electrical users or transmitters to allow assessment of their impact.

Defence Receiving Stations - Harman and Bonshaw

The sensitive and sophisticated nature of modern communications equipment renders a high degree of protection a matter of metropolitan significance, because of the area of land which is potentially sterilised from development and the complexity of some protection measures.

The Commission, in its planning, consults with the Department of Defence and takes all reasonable steps to protect Defence wireless communications from significant adverse physical and generated

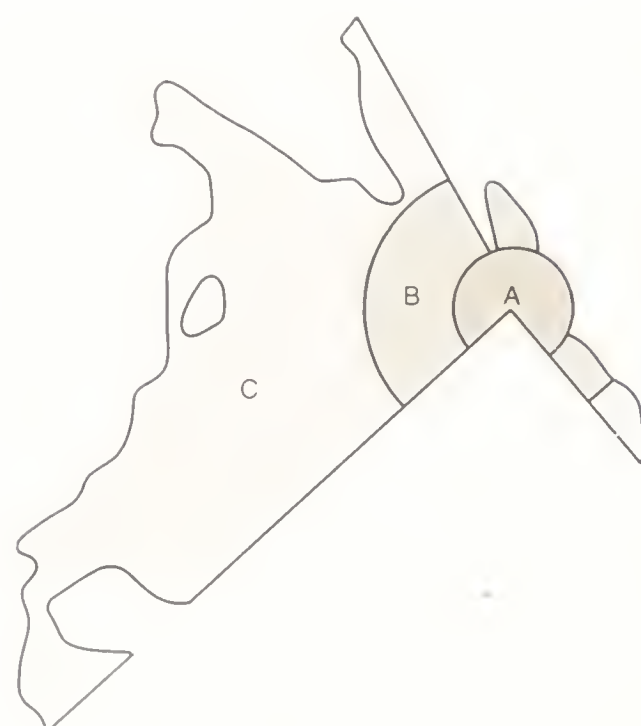


Figure 47 Zone Constraints

effects of urban and associated development. The Australian Interdepartmental Telecommunications Advisory Committee Code of practice 1976-77 identified three concentric zones of consultation:

- 2 km radius - residential development
- 6 km radius - industrial development, main roads, etc.
- 16 km radius - high electrical energy users, transmitters, hospitals

The Harman-Bonshaw facility may be relocated in an area remote from urban development in the next 5-10 years to reduce interference effects on its operations.

Defence Transmitting Stations

RAAF Gungahlin is surrounded by a protection zone within which the height of structures is limited.

No constraints are imposed on development outside the boundaries of the Belconnen Naval Station. The station may be relocated in the next 10 years and so release the land which it now occupies for additional residential development.

Microwave Links

The use of microwave links between various defence and emergency service facilities is increasing. Some of these may require protection in the future.

Mount Stromlo Observatory

The Form of Arrangement between the Commonwealth and the Australian National University for the transfer of the Mount Stromlo Observatory made in January 1957 states:

‘The Commonwealth will ensure that the land which is within the area bounded by the Cotter Road, a meridian line one mile to the west of the Stromlo Trigonometrical Station, the Uriarra Road and a meridian line three-quarters of a mile to the east of the Stromlo Trigonometrical Station... will not be used for any purpose... which, is injurious or prejudicial to the operation of the Observatory...’.

Canberra Airport

The height of structures in an area around the airport can be critical to airport operations, depending upon ground elevation and flight paths. Consultation with the Departments of Defence and Aviation is undertaken in the case of structures likely to infringe the clearance requirements.

Noise Exposure Forecasts (NEF) for 1985 also impose constraints on development. Generally, only broadacre, institutional, recreational or rural uses are acceptable within the 25 NEF zone.

Quarries

The main source of quarrying materials in the ACT is the Mugga porphyrys which occur along Jerrabomberra Ridge to Mt. Mugga. The two existing quarries are in this area and a possible site for a third quarry has been identified.

A buffer zone of 1 km is maintained around the quarry sites in order to ensure protection from noise, air blast overpressure and ground vibration nuisance. Within this protection zone, only development compatible with quarry operations is to be permitted.

RMC Field Firing Range

The firing range is used for training of officer cadets at the Royal Military College Duntroon and the Australian Defence Forces

Academy. Existing unexploded bombs and shells would need to be removed, at a high cost, if the area is to be considered for any urban use.

Australian Federal Police Firing Range

A firing range may be sited at Kowen, and if so, the range and its clearance template could both become constraints on development in the vicinity.

Approach to Planning

Identifying the Scope of the Work

In defining the scope of the work to be undertaken by the study, the following factors were considered:

- the considerable investment already committed to the existing and proposed urban structure derived from the Y-Plan
- the population capacity of the existing and proposed settlement areas of the Y-Plan lying within the Australian Capital Territory
- the population projections which indicated that these settlement areas (excluding West Murrumbidgee) would not be completely settled to their capacity of about 380 000 until about the turn of the century.

In terms of examining alternative urban structures to the Y-Plan itself, the previous work undertaken in 1976 was used as a basis. This work established that opportunities to depart from the intermediate form of the Y-Plan (the Y-Plan within the ACT) were long-term and would not occur until the population level approached 400 000-450 000 (under the settlement pattern and housing occupancy rates assumed at that time). The work also established that until these population levels were approached, the intermediate Y-Plan was as valid as any alternative urban structure and on environmental grounds had certain distinct advantages.

The work in 1976 examined development opportunities in the Molonglo, Majura and Jerrabomberra Valleys and found that each had significant environmental or other constraints, which precluded their development for urban purposes in the near future. Parts of the Molonglo Valley for example, lie within the Areas of Special National Concern. In addition, the Molonglo River itself is a valuable recreation resource and urban development might degrade its water quality and cause pollution of the Murrumbidgee River. In essence, the same concerns currently applying to development in Tuggeranong, adjacent to the Murrumbidgee River, also apply to the Molonglo Valley.

With regard to the Majura Valley, much of its area is utilised for the Canberra Airport and its approaches and for a field-firing range of the Department of Defence. The investment in the airport precludes its relocation even if a suitable site could be found and the Department of Defence has indicated that the field-firing range location is essential to the operation of the Australian Defence Forces Academy. Moreover, preliminary investigations have shown that the cost of clearing the area of possible unexploded devices could well be prohibitive.

The Jerrabomberra Valley is a comparatively small area for urban development and is currently constrained by the Naval establishments

at Harman and Bonshaw. Existing commitments to protect large areas surrounding these establishments in order to ensure freedom from interference to radio reception preclude development of the area until such time as the establishments are relocated.

In order to deal effectively with the short and mid-range problems of the City, it was considered that the main thrust of the work should be concentrated on refining and evaluating various options for the distribution of key metropolitan activities within the framework of the intermediate Y-Plan.

The next stage of the work was to pose a series of key questions relating to the future development of the City, bearing in mind the matters canvassed in the 1980 *Metropolitan Issues - Public Discussion Paper* and the general public response received. The key questions included the following:

- what should be the aims and objectives for the future planning of the National Capital?
- what planning assumptions can be made about the future?
- given the forecasts about the future, what is the anticipated growth and change in activity needs?
- do the current metropolitan policies and development proposals need to be reviewed and amended in the light of changing circumstances?
- what do the past trends tell us about the City; can these trends be expected to continue; and is there a need to modify immediate trends with policy initiatives?
- what options are there for accommodating future growth and change?
- how can these options be tested and evaluated?
- when a preferred option has been identified, how can its economic and financial feasibility be tested in broad terms?
- what metropolitan policies are essential to the implementation of the preferred plan?
- how can the preferred plan be implemented to ensure an optimum balance of metropolitan systems at successive stages of population growth?
- how can the next major settlement area be decided; should the Commission continue to develop the new town of Tuggeranong, phase it out and commence the new town of Gungahlin, or develop in both new town areas?

Aims

Aims are generalised statements of society's aspirations which the creation of an efficient physical structure and a good environment will go some way towards satisfying. Aims tend to be idealistic, but they point the way in which planning action should be broadly directed. The setting of the following aims was based on both an awareness of the metropolitan issues facing Canberra and on the results of continuing discussions with interest groups and the general public.

Image: to provide a distinctive setting for Canberra which clearly identifies the City as Australia's National Capital and Seat of Government, and to provide a clear framework for growth and change which will be able to meet the functional needs of all the activities associated with Canberra's role as the National Capital.

Canberra enjoys a unique physical setting and the preferred plan should seek to create a physical structure for the metropolitan areas which would make full use of the variety of land forms and the scenic setting of the National Capital site.

The Central Area occupies a dignified and quiet setting within which the business of government can be carried out efficiently. It will require protection from future land use and transport pressures that could otherwise overwhelm it, yet, at the same time, there needs to be a clear physical relationship between National Capital functions and the network of communications which links them to other activities.

Social and Economic Need: to provide sites in appropriate locations for the social and economic activities of the present and forecast population.

The plan should seek to provide a broad framework which will maintain the quality of life currently enjoyed by the existing residents of Canberra. The plan should also seek to facilitate the provision of health, welfare and educational facilities.

Due to the scale of the expected future urban development, substantial amounts of money will need to be invested by both public and private enterprises to realise the plan's proposals. The plan, therefore, should seek to guide development in such a way as to make efficient use of such investment.

In order to minimise costs, the fullest use should be made of the existing or committed facilities and the transport and other network systems in determining the location of new developments and activities, including the phasing of development.

Environment: to satisfy community needs by creating safe, healthy, attractive and convenient surroundings for living, working, shopping, education and recreation.

Various planning studies have highlighted the high quality of the present physical environment of Canberra. The community has expressed a strong desire that these environmental standards should be maintained in the future. The plan, therefore, should seek to ensure that traffic in residential areas is limited to levels which would not adversely affect the safety of residents or significantly diminish their amenity. It should also seek to ensure that air quality is maintained at a level which does not adversely affect public health and that water runoff is controlled so that water quality can be maintained at a level which will not adversely affect use for recreation purposes or be detrimental to ecological systems.

Choice: to provide people with a wide choice for housing, and convenient shopping, recreation and employment opportunities, and to provide opportunities for private businesses.

The plan is intended to guide the economic, social and physical development of Canberra in the interests of the residents of the City as a whole. It should seek to provide a broad range of housing, employment opportunities, comparative shopping and recreational facilities.

Conservation: to conserve and protect important natural and man-made features of the ACT and to implement new development in such a way as to cause the least disturbance to the existing urban, rural and natural areas.

The people of Canberra presently enjoy a wealth of valuable natural and man-made resources. The ACT contains tracts of attractive and unspoiled countryside, important areas of grazing and agricultural land and significant river systems and forest areas. In addition, the settlement areas and surrounding villages contain important areas of quality and character, and distinctive buildings and settings worthy of conservation. The plan should seek to ensure that the adverse effects on future growth on these resources are minimised.

Movement: to ensure that the plan's land use and transport system enables people to travel and goods to be moved conveniently and efficiently about the metropolitan area.

One of the major issues facing the future Canberra is the need to develop a transport system which will be capable of securing adequate mobility for the entire population and to do this within the financial budget likely to be available. The plan should seek to strike a realistic balance between public and private transport in an inter-related system of traffic movement which will satisfy both personal and commercial travel needs with a minimum of congestion and a maximum of safety.

Flexibility: to be adaptable so that the plan can cope with variations in circumstances.

Studies of financial resources, urban form, and technological, social and industry trends, emphasise that a plan concerned with developments over the next twenty years cannot be fixed and finite. It must allow, as far as possible, for changes in, for instance, the location and rates of expansion and growth both in the short and long-term, and should be able to cope with such circumstances. The plan should seek to minimise the sensitivity to alternative phasing possibilities and changing parameters in the economic base of the City.

Implementation: to ensure that the plan can be carried out effectively.

The success of the plan is heavily dependent on the extent to which its policies and proposals are carried out. The responsibility for realising these will be shared by both the private sector and public authorities. The plan's policies and proposals should, therefore, be formulated having regard to the ways and means of implementation, the foreseeable organisational powers of the Commission, realistic levels of public expenditure and likely political acceptance.

Planning Assumptions

These are qualitative or quantitative matters used in preparing plans which may, or may not, be susceptible to control or influence by the planning authority. For example, assumptions need to be made about migration rates, which form part of the population growth projections; future levels of car ownership and public transport systems, which form an input to the transport modelling; the growth in the government office workforce and the Commission's ability to influence work location, which is an important input to land use and transport relationships; and the likely levels of financial resources which will be available to implement the plan.

Given the long-term nature of the plan's proposals, the assumptions and forecasts of activity growth need to be carefully monitored throughout the plan period in order to ensure good plan performance. Changing situations which result in significant variance between predicted and actual circumstances will signal the early need for a review of the plan.

In generating alternative plan options, the following assumptions were made.

Queanbeyan

Although Queanbeyan is not part of the Australian Capital Territory, its location adjacent to the ACT border requires its interactions with the urban and natural systems of Canberra to be considered. It was therefore assumed that Queanbeyan was part of the metropolitan study area for the purposes of plan formulation and testing.

Employment

Employment assumptions were derived from the 1982 NCDC population projections. Over the following twenty years, employment in the ACT and Queanbeyan was projected to rise to 185 600 – an increase of about 75 000 on the existing level. This would create a jobs to population ratio of 45.5 per cent.

A marginal increase in the share of employment to industrial area was assumed to result from the development of the Canberra Technology Park at Bruce and initiatives by the Canberra Development Board.

Population

The 1982 NCDC population projections were assumed. Over the following twenty years, the metropolitan population was projected to grow to 408 000. The distribution of this population was assumed as being:

- Inner Canberra, population stabilised at about 62 000, with progressive and selected redevelopment, regeneration and infill balancing falling population levels caused by population ageing and outward migration to developing areas
- Woden-Weston Creek, population stabilising at 60 000
- Belconnen, population settlement completed and stabilised at 83 000
- Tuggeranong, population of 89 000 (excluding land west of the Murrumbidgee River)
- Gungahlin, fully settled with a population of 84 000
- Queanbeyan, progressively settled to a population of 30 000.

Implicit in these settlement figures was the further assumption that the eventual occupancy rates for standard residential dwellings would be 3.0 and the eventual occupancy rates for medium-density dwellings and flats would be 1.8. A slight increase in the proportion of medium-density dwellings and flats was also assumed. The same land settlement pattern was common to the generation of all alternative plans.

Retail

It was assumed that the retail provision would be 585 300m² by the 408 000 population level, a provision approaching 1.45m² per capita. This would represent an increase of about 180 000m² on the current provision in Canberra/Queanbeyan.

Transport

It was assumed that the existing line-haul and feeder system which currently provides a high level of public transport service would be retained and extended to the new towns of Tuggeranong and Gungahlin.

The standard of road provision was assumed to remain at approximately the current standards, except in those parts of the built environment where additional roads or lanes could not be provided.

The existing morning peak-hour trip generation was assumed to represent the future situation, since most trips are home-based, and work or school related, and little change is forecast in these characteristics in the short to medium-term. The existing average daily mode split conditions were assumed to apply in the future situation. However, some spatial and distributional changes were predicted. In the peak hour, mode split was assumed to increase for travel to the existing town centres, due to the shortage of land available for car parking. It was assumed to remain about the same for travel to other destinations. This was justified by the fact that the rate of growth of public transport patronage has reduced in the last few years and may now have levelled off. Experience, both in Australia and overseas,

shows a decline in the use of public transport while the annual subsidy needed to operate the public transport system has been increasing steadily.

Therefore, in the calibration of the transport model *Transtep*, it was assumed that trip-making characteristics and, in particular, trip generation and trip length frequency in the future City would remain similar to those rates prevailing in the City today.

Financial Resources

Financial resources were assumed to be within the limits of past budgetary trends and adequate to meet the basic provisions of infrastructure and future needs at standards slightly lower than current conditions.

Environment

Previous public consultation programmes and surveys of the Canberra environment have indicated that the majority of the population are satisfied with Canberra as a place in which to live, work and participate in leisure activities. The ability to move around the City easily, free from the congestion experienced by other cities, the closeness to rural recreation areas and open countryside, the air quality, the quality of the water in the rivers and streams around the ACT and the quality of the landscape setting were some of the factors mentioned as being positive attributes of Canberra. It was therefore assumed that the plans would reflect Canberra's present lifestyle in respect of these aspects whenever possible, and that where departures occurred, there were identifiable public benefits to be gained.

Water Resources

In view of the water resources issues and trends identified in Chapter 4, it was assumed that ongoing development would be based on:

- full provision of sewerage, with treatment to the existing high standard at Lower Molonglo Water Quality Control Centre
- adoption of water pollution control ponds to contain urban runoff pollutants in Tuggeranong and Gungahlin
- adoption of an urban form and structure in Gungahlin consistent with minimising the generation of pollution from urban runoff
- water consumption and wastewater generation standards remaining constant with the use of charges and education programmes to offset normal increases
- continued growth in water-based recreation demands.

Generation of Alternative Plans

Development of the Two Plan Options

Fundamental to the work was the generation and sifting of alternative plans. This was a cyclical process, whereby a large number of sketch outline options were progressively grouped into two main families of plans so as to maximise the contrast between them.

These two groups of plans were classified according to different degrees of concentration or dispersal of employment opportunities and comparative retail floorspace in relation to the settlement pattern which was constant for each option. From these two main families of plans, the most representative option from each was selected as the basis for more detailed plan development and evaluation.

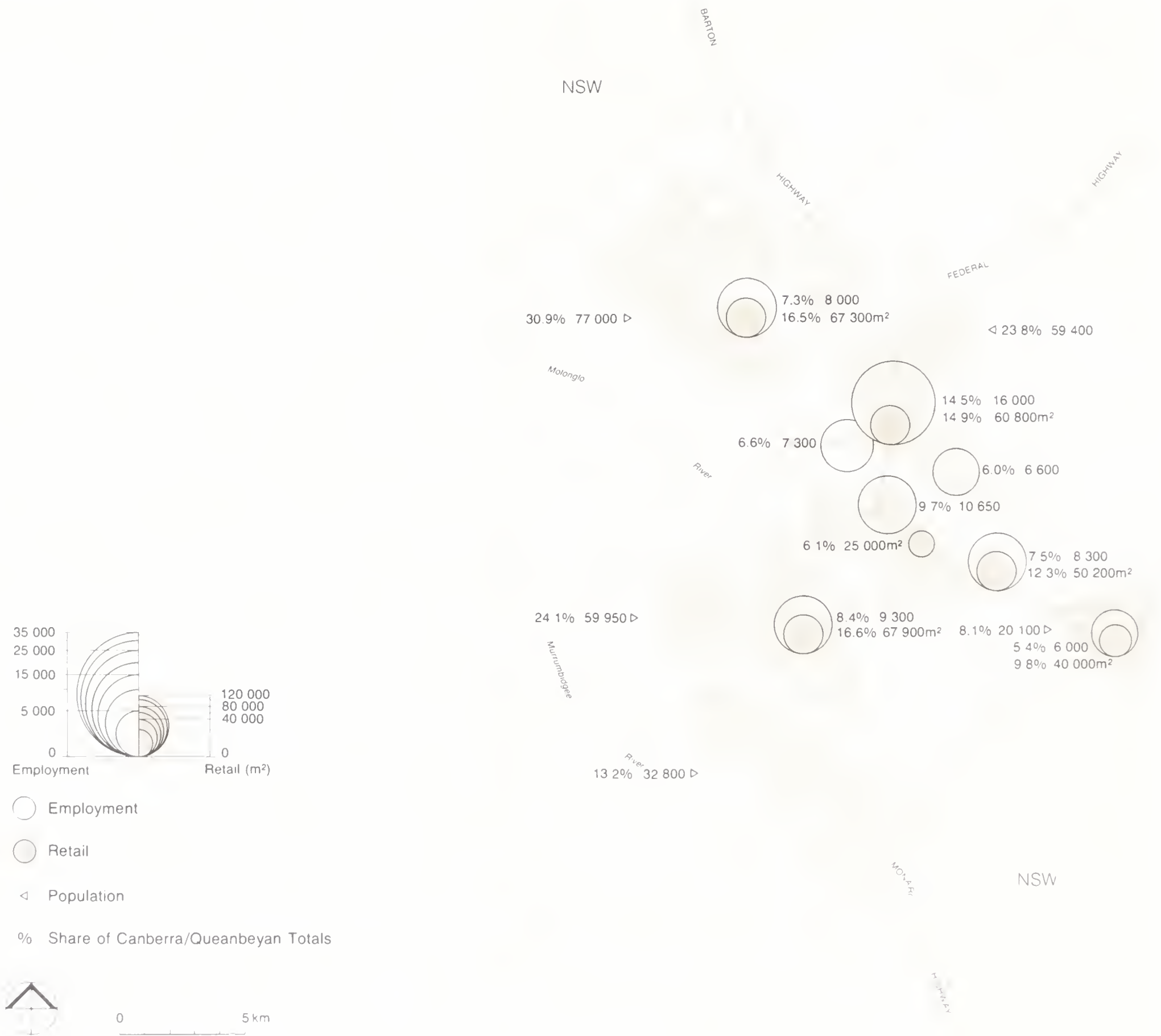


Figure 48 Population, Major Employment and Retail Nodes - June 1982

Alternative 1 - Concentrated Plan

In this Plan (Figure 49), growth in employment opportunities and retail floorspace was directed into the Central Area and the Woden and Belconnen Town Centres. At the 408 000 population level, this Plan has an urban structure in which:

- the Central Area would be allowed to expand relatively unconstrained to the point where transport accessibility problems would force an overspill of these activities to the Woden and Belconnen Town Centres. Employment in the Central Area would grow by about 33 100 to 77 900; and employment in Civic, a major node within the Central Area, would grow by 19 000 to 35 000, with retail floorspace in Civic increasing by about 50 000m²
- the Woden and Belconnen Town Centres would then be allowed to expand, to provide a further concentration of employment opportunities and comparison retail floorspace and would serve a metropolitan function rather than a town function in relation to these activities. Employment at the Woden and Belconnen Town Centres would grow by 8 400 and 10 000 respectively. Retail floorspace would grow by 22 000m² in each centre

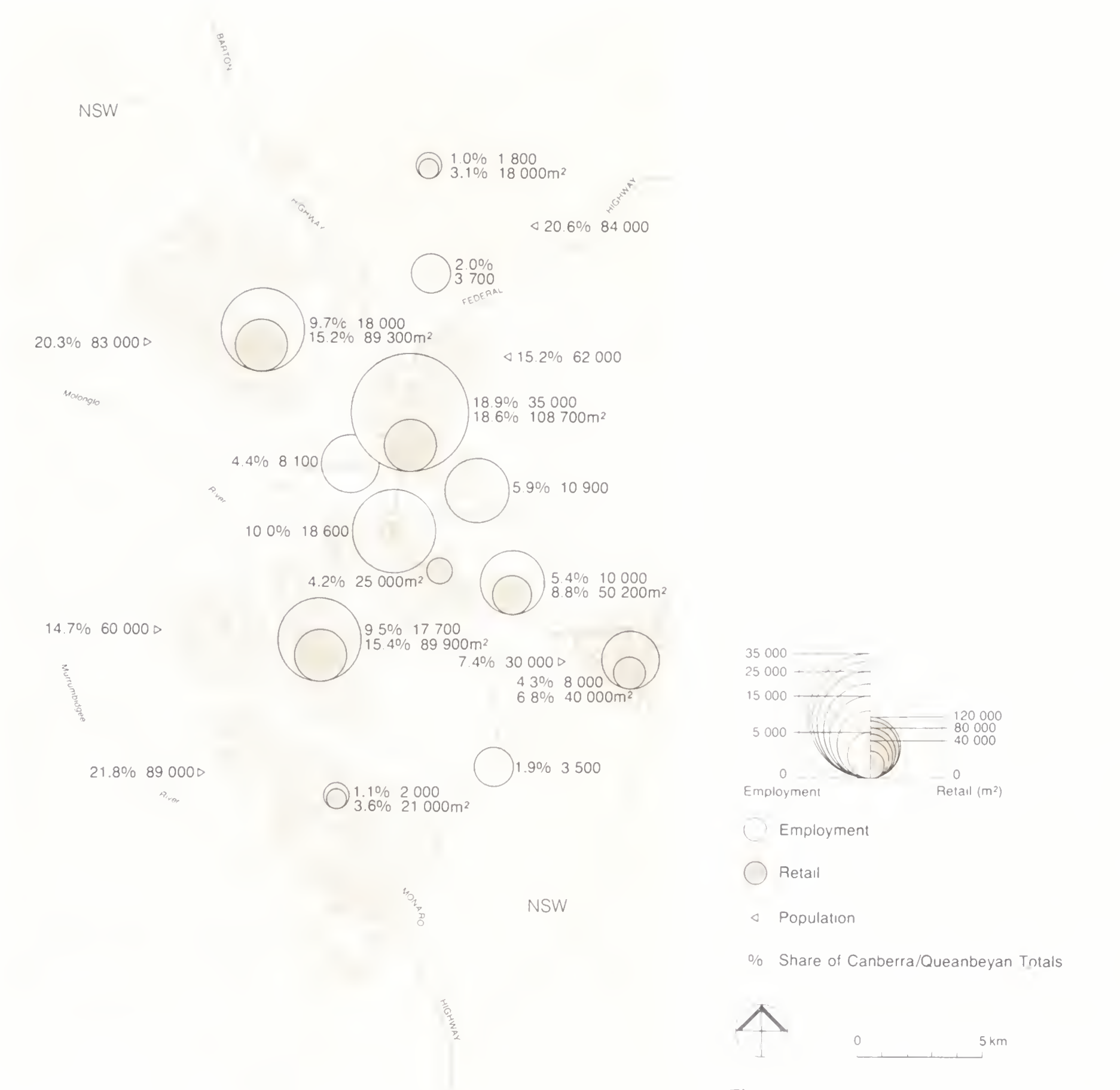


Figure 49 Population, Major Employment and Retail Nodes - Concentrated Plan

- the new towns of Tuggeranong and Gungahlin would not be provided with town centres and, consequently, would be without a significant level of town centre employment opportunities and comparative retail shopping. The residents of these towns would therefore have longer distances to travel to employment opportunities and comparison shopping than residents of other towns. Expanded group centres would be provided to meet in part the needs for comparative shopping in these towns.

Alternative 2 - Dispersed Plan

This Plan (Figure 50) assumed that the Commission could significantly influence the dispersal of employment and retail opportunities along the lines envisaged by the original Y-Plan and successfully carried out in the new towns of Woden and Belconnen. At the 408 000 population level, this Plan has an urban structure in which:

- employment in the Central Area would grow by about 19 500 to 64 300. As a component of this total, Civic's employment would grow by 9 000 to 25 000 and retail floorspace in the centre increases by 15 000m²

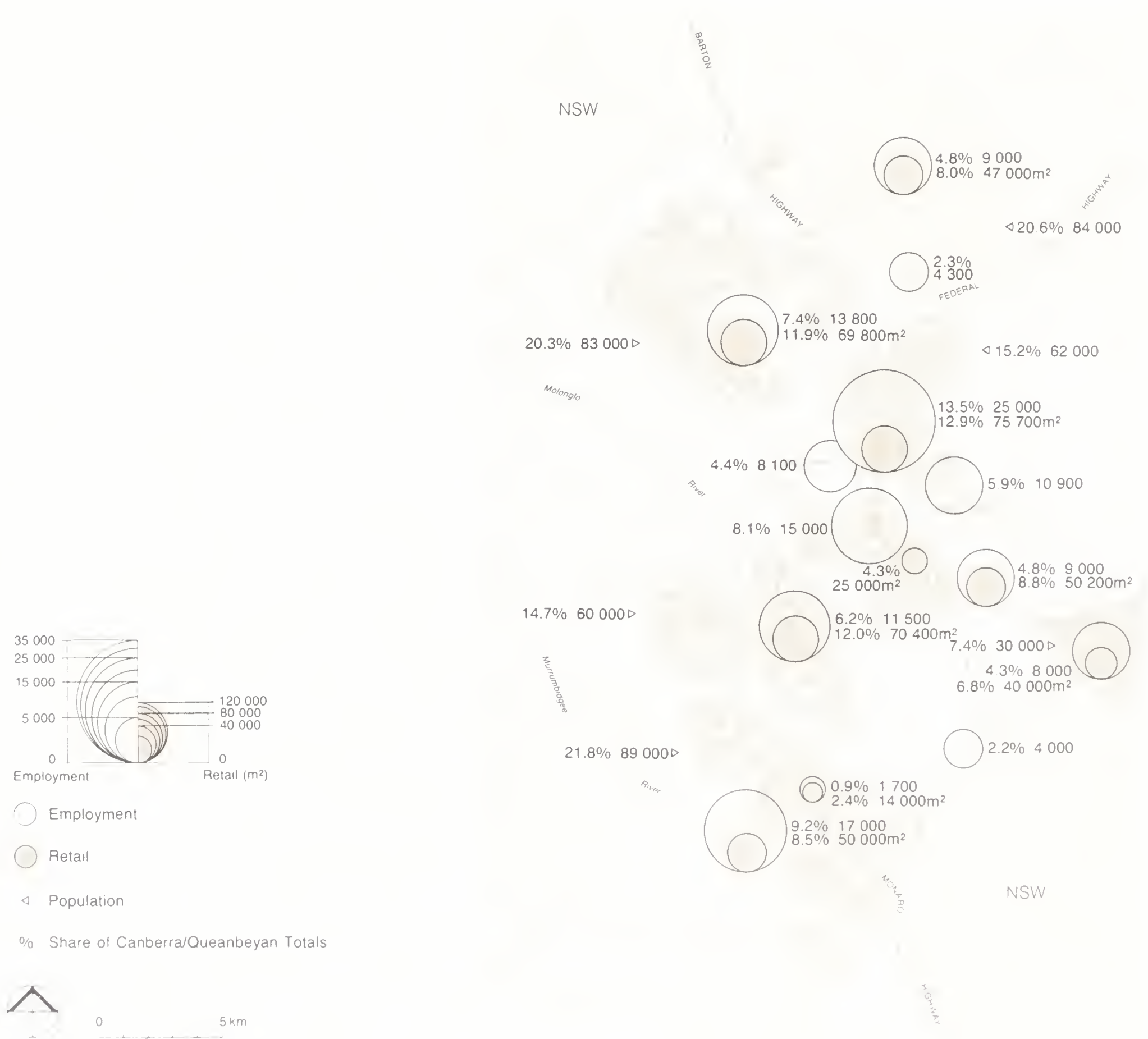


Figure 50 Population, Major Employment and Retail Nodes - Dispersed Plan

- the Central Area would be prevented from becoming congested by the decentralisation of employment and retail floorspace to new town centres. Employment at Woden Town Centre would be increased by 2 200 and at the Belconnen Town Centre by 5 800. Retail floorspace at each centre would increase by 2 500m²
- Tuggeranong and Gungahlin new towns would be provided with town centres having significant levels of employment opportunities and retail floorspace related to their town needs. This would also assist in achieving the metropolitan objective of decentralisation. Tuggeranong Town Centre would include 17 000 employees and 50 000m² of retail floorspace, and the Gungahlin Town Centre would include 9 000 employees and 47 000m² of retail floorspace. In Tuggeranong, an expanded group centre would be provided at Erindale, as an interim solution until the town centre could be provided. However, in Gungahlin, the town centre would be staged to meet the needs of the population and an expanded group centre would not be required
- the Central Area would remain dominant in relation to employment opportunities. The town centres of Woden, Belconnen, Tuggeranong and Gungahlin would primarily serve their respective town catchments, as originally intended.

In both plan options, employment in the industrial areas of Fyshwick, Hume and Mitchell is about 17 000. Fyshwick retailing was assumed not to expand beyond its current level of 50 000m² .

As the Commission has no direct control over the population, employment or retail floorspace levels in Queanbeyan, the growth of Queanbeyan in both options was related to overall growth in the region. Employment in Queanbeyan was assumed to increase by 2 000, while it was assumed that retail floorspace would remain at its current level.

Employment Distribution

Employment was distributed to the various employment centres in both plan options in different degrees of concentration. These employment centres were:

- the Central Area (Figure 51), comprising the defence headquarters, Russell and the Campbell Park complex; the ANU CSIRO Royal Canberra Hospital education, research and health complex; Civic



Figure 51 The Central Area

- Centre; the Parkes/Barton office area, and ADFA Domain, Anzac Parade and Braddon
- Town Centres
- Secondary Zones, comprising the industrial estates at Bruce, Fyshwick, Hume and Mitchell, the Queanbeyan City Centre and large group centres
- Local Zones, consisting of employment within the settlement areas at educational establishments, local shopping centres and construction sites, etc.

The degree of concentration/dispersal to these areas is shown in Table 50.

Table 50 Distribution of Employment Opportunities

	Existing (1982)	Concentrated Plan	Dispersed Plan
Central Area			
ANU/CSIRO/Hospital	7 300	8 100	8 100
Civic Centre	16 000	35 000	25 000
Parkes/Barton	10 650	18 600	15 000
Russell/Campbell Park	6 570	10 900	10 900
Other	4 300	5 300	5 300
Total	44 820	77 900	64 300
Town Centres			
Belconnen Town Centre	8 000	18 000	13 800
Gungahlin Town Centre	-	-	9 000
Tuggeranong Town Centre	-	-	17 000
Woden Town Centre	9 300	17 700	11 500
Total	17 300	35 700	51 300
Secondary Zones			
Bruce	1 700	3 000	3 000
Erindale Centre	200	2 000	1 700
Fyshwick	8 300	10 000	9 000
Gungahlin(1)	-	1 800	8 000
Hume	230	3 500	4 000
Mitchell	740	3 700	4 300
Queanbeyan	6 000	8 000	8 000
Total	17 000	32 000	30 000
Local Zones			
Belconnen	5 575	5 950	5 950
Gungahlin	-	4 600	4 600
Inner Canberra	14 505	14 855	14 855
Tuggeranong	2 450	5 500	5 500
Woden-Weston Creek	6 985	7 030	7 030
Other ACT	1 385	2 035	2 035
Total	30 900	39 970	39 970
Total	110 020	185 570	185 570

(1) Expanded Group Centre.

The significant difference between the two Plans is the degree of concentration of employment opportunities in the Central Area and Town Centre nodes. This was largely brought about by the absence of town centres in the Gungahlin and Tuggeranong new towns.

In the Concentrated Plan, the Central Area would be built up to contain 77 900 job opportunities, with the major employment area being Civic with a 45 per cent share of all the jobs in the Central Area. In the Dispersed Plan, the Central Area would be slightly smaller with 64 300 job opportunities; again, Civic was given the dominant concentration of 39 per cent of all the jobs in the Central Area. In

addition, the number of jobs allocated to Parkes Barton was also slightly reduced.

In both plan options, the distribution of job opportunities to local zones was the same.

Retail Distribution

Retail floorspace was distributed to three functional areas in both plan options in different degrees of concentration. These functional areas were:

- Town Centres
- Secondary Zones, comprising Fyshwick, Queanbeyan and large group centres
- Local Zones within the settlement pattern at the group, intermediate and neighbourhood shopping level.

The relative degree of concentration/dispersal to these zones for the alternative Plans is shown in Table 51.

Table 51 Distribution of Retail Floorspace (m)

	Existing (1982)	Concentrated Plan	Dispersed Plan
Town Centres			
Belconnen Town Centre	67 300	89 300	69 800
Civic Centre	60 770	108 700	75 700
Gungahlin Town Centre	-	-	47 000
Tuggeranong Town Centre	-	-	50 000
Woden Town Centre	67 900	89 900	70 400
Total	195 970	287 900	312 900
Secondary Zones			
Erindale Centre	-	21 000	14 000
Fyshwick	50 200	50 200	50 200
Gungahlin(1)	-	18 000	-
Queanbeyan	40 000	40 000	40 000
Total	90 200	129 200	104 200
Local Zones			
Belconnen	28 180	30 260	30 260
Gungahlin	4 240(2)	29 240(2)	29 240(2)
Inner Canberra	48 500	48 580	48 580
Tuggeranong	7 600	27 950	27 950
Woden-Weston Creek	31 260	32 160	32 160
Total	119 860	168 190	168 190
Total	406 030	585 290	585 290

(1) Expanded Group Centre.

(2) Includes retail floorspace in Mitchell Industrial Area.

In both Plans, the total level of retail floorspace was held constant as was the level at local centres.

Retail floorspace in Queanbeyan and Fyshwick was assumed to remain at existing levels. Although they may expand beyond these levels, the following assumptions were made. Queanbeyan floorspace in 1980 had substantially lower trading levels than that of Canberra (below \$1 000 per square metre compared to \$1 420 for Canberra) and its provision of floorspace at 2m² per capita was higher than that of Canberra. It was, therefore, assumed that the level of floorspace would stay at its existing level with the turnover and provision per capita changing to become closer to the Canberra level. With regard



Figure 52 Road Network for Transport Testing

to Fyshwick, it was assumed that Commission policy would be aimed at discouraging further expansion of retail facilities.

The distribution to local zones was held constant for both plan options. It should be noted that the allocation to Inner Canberra local zones assumed no increase in retail floorspace and that fairly negligible increases were assumed for both Belconnen and Woden-Weston Creek local zones, because of the stabilising population levels.

Transport

The road network (Figure 52) was compiled and calibrated to cover the testing of both Plans. The process was iterative and covered the following steps:

- a preliminary network was established by extending the existing system to cover the proposed Plans
- this was then related to population settlement and the differing distribution of employment opportunities and retail floorspace
- the preliminary network was used to ascertain the total traffic demand using assumptions based on the current mode split between public and private transport
- the total demand was then distributed throughout the preliminary network which was then refined, in order to balance land use and transport relationships
- the revised network was then tested using the transport model *Transtep*, in order to evaluate the total system operation
- the network was again refined to optimise the land use and transport relationship using an iterative process
- trip tables were generated and assigned to the refined network for final testing and evaluation of the plan options.

The existing comprehensive system of bus services operating on the road network system was expanded to cover both plan options, on the assumption that local services would continue to be provided to meet future demand. Provision for express services was related to differing mode split assumptions and car parking availability at major employment and retail centres.

The provision of car parking facilities in each plan option was related to:

- mode split assumptions
- the estimated requirement at major employment and retail nodes
- the availability of land for parking facilities, which, in turn, provided an indication of the level of parking required in structures.

Framework for Evaluation of Alternative Plans

Assessments at the metropolitan level are necessarily broad in their approach, coarse-grained in regard to quantitative measurement, and judgemental in those cases where qualitative assessments have to be made, either because of the lack of a suitable methodology, insufficient data, or a combination of both. Plan assessments were aimed at evaluating overall performance and at identifying areas where additional work and longer-term studies would be required to clarify the issues identified. Assessments of the Plans included the following types of evaluation.

A Transport Evaluation

Research has shown that the total infrastructure and operating costs of the transport system have about four times the impact of other urban systems on the urban structure of a city. Methodology for transport testing and analysis is well developed in relation to other urban evaluation methods, and measures of the transport system provide useful quantitative and qualitative measures of social indicators, such as accessibility and self-containment; environmental indicators, such as air quality, noise levels and traffic intrusion into residential areas; and economic indicators, such as total travel costs, infrastructure needs, reverse loading ratios, congestion and energy costs. For these reasons, the testing of the land use transport systems received considerable attention in the evaluation phase of the study.

Both Plans were tested using a strategic transport planning model, *Transtep*. This programme provides comparative data for the synthesis and analysis of alternative land use transport plans according to particular planning policies. The model is structured along the lines of the traditional four-step transport models, (trip generation, trip distribution, mode split and trip assignment). However, it is responsive to changes in accessibility and other factors, which affect trip generation and trip distribution. The model outputs included:

- total trips generated
- travel costs (time, distance or generalised cost)
- reverse loading ratio
- several accessibility measures
- self-containment measures
- network loadings, etc.

This information was used to identify problems and infrastructure requirements in the transport system, to optimise the landuse strategy and provide evaluation criteria for comparing the performance of the land use transport system.

A Centres Evaluation

This was carried out to assess the impact of the varying degrees of concentration or dispersal of employment and comparison retail floorspace to the existing and proposed major centres. Evaluation included the impact of the transport system necessary to service the centre, economic impact of trading within and between the centres and the environmental impact of the various proposals.

An Aims Achievement Evaluation

This evaluation was carried out to determine how the Plans performed when measured against the stated aims for the future Canberra. This evaluation drew, in part, from the transport and centres assessments and from quantitative assessments of issues related to the social and environmental impacts of the Plans. The evaluation was aimed at formulating a broad overview of the impacts of the alternative Plans in order to ensure that adequate consideration had been given to all of the systems of the City.

Transport Evaluation

Transport has a major influence on the structure of cities and the lifestyle of their inhabitants. People spend a considerable part of each day travelling and a significant proportion of their disposable income on transport. The transport evaluation compared the relative performance of the two plan options in terms of new transport infrastructure required and likely effects on travellers.

In order to compare the impacts of the two plan options, it was necessary to forecast the pattern of travel in the future City and derive an efficient and balanced total transport system for each option. It is important to develop an optimum economic package, as transport is a major component of development costs. Moreover, the transport system must be flexible to accommodate variations in daily travel patterns and the timing or staging of development and also to cope with unforeseen circumstances.

The evaluation of the road system considered the structure of the existing road system, previous investment and under-utilised road capacity. It assumed a tolerance to higher levels of traffic congestion than are currently experienced and identified the new roads and main works associated with future development.

The evaluation of the future public transport system analysed the opportunities and effects of increasing the use of public transport associated with both plan options.

Car parking needs at the town centres and in the Central Area were identified as part of the centres evaluation. The analysis considered the effects of increasing mode split, and identified the amount of structured and surface parking which would be required.

Transport evaluation, therefore, contains two sections dealing with:

- the road network
- the public transport system.

Road Network

Determining the Future Road Network

Based on the Commission's current transport planning philosophy, a basic metropolitan-scale road network was developed for testing purposes which took account of the relative proportion of employment and retail opportunities in each district under both plan options.

This network linked the existing and proposed population settlement areas and the key activity centres. Alignments of new roads were related as closely as possible to the principal travel design lines and to the topography. The basic road network is shown in Figure 52.

Assumptions were made regarding the standard of provision, average speeds and traffic flows. The basic network was then used in conjunction with the forecasting models to predict future traffic loadings.

The projected traffic loadings were used to assess traffic conditions on each section of the network. The assignment process assumed there would be no capacity limitations and the traffic volumes obtained were related to the estimated capacity of major metropolitan roads. This established the basic cross-section (number of lanes, type of road) which was used in the assessment of future road needs. The standards used in the capacity analysis were developed from the NAASRA guidelines and are provided in Table 52.

Table 52 Design Capacities for Metropolitan Roads

Facility	Capacity (Vehicles/Hour/Lane)					
	Mid-Block		Signalised Intersection		Priority Intersection	
			Main Road	50% Green Time	Main Road	50-80% Split
	'C'(1)	'D'(1)	'C'	'D'	'C'	'D'
Expressway	1400	1700	-	-	-	-
Major Arterial	1200	1460	630	710	600-960	730-1170
Sub-Arterial	1000	1200	520	630	500-800	600-960
Town Centre Distributor	1000	1200	520	630	500-800	600-960
Residential Distributor	-	-	-	-	-	500-600(2)
Residential Collector	-	-	-	-	-	300-360(2)
2-lane 2-way Limited Access	1400(3)	1700(3)	-	-	-	-

(1) Level of Service 'C' and 'D' as defined in NAASRA Guide to Traffic Engineering Practice.

(2) One-way capacity.

(3) Total two-way capacity.

The likelihood of future reduction in funds for transport facilities was considered throughout the analysis. This is reflected in higher service volumes for a particular level of service category in the preceding table and the lower standard of facilities assumed in the basic network(e.g. arterial roads instead of parkways).

The analysis was based on peak-hour travel demands and assumed existing rates of peak-hour trip generation. A range of mode split assumptions, based on the current level of 15-18 per cent and a situation where the mode split to major town centres was 30 per cent, were tested. An increase in mode split would have a beneficial impact by reducing the number of car trips and the level of congestion in the peak hour. The mode split would need to more than double, however, before there would be any noticeable change to the recommended scale of metropolitan roads.

As traffic congestion is not expected to occur over most of the network between the peaks, travel demands at this time of the day were not considered in the evaluation of road needs. Exceptions to this rule occur on the roads in and around Civic and other major commercial or retail centres. Although there will be serious congestion, traffic volumes will be generally less than during the peaks, as congestion will be the result of major interaction between pedestrians and vehicles, or between parking and circulating traffic. Congestion is generally considered to be acceptable under these conditions, and helps to discourage through-traffic.

The evaluation was not intended to provide a comprehensive social cost-benefit analysis, and should only be viewed as a general comparison of two disparate development strategies, from which appropriate policy and planning guidelines can be drawn.

The Scale of Future Metropolitan Roads

Concentrated Plan

The scale of metropolitan roads required under the development conditions implied by the Concentrated Plan is shown in Figure 53. The major features are as follows.

(a) Third Lake Crossing

A third bridge across Lake Burley Griffin, in conjunction with improved access to Civic Centre, would be necessary.

The analysis highlighted a need for the equivalent capacity of ten parkway lanes in each direction crossing the lake. The large concentration of employment in the Central Area (approximately 79 000 employees) generates the main travel desires. The existing

Commonwealth and Kings Avenue Bridges and the Capital Circle/State Circle rotary interchange are major constraints and limit the extent to which access roads can be upgraded. Problems at these existing bottlenecks would be exacerbated by the proposed increased development in Parkes/Barton.

There is also a limit to the potential capacity improvements to Tuggeranong Parkway. The analysis suggests that the maximum is three lanes in each direction at the Glenloch Interchange due to the merging of Belconnen traffic. While the Eastern Parkway theoretically has an unlimited capacity, it is anticipated that it will only be attractive to a limited number of users.

The resulting distribution of road capacity across the lake, under this option, is described in Table 53.

Sensitivity tests indicated that even if a very high mode split to the Central Area were possible, it would not eliminate the need for the additional lake crossing. The reduction in traffic volumes would be offset by a need for an exclusive right-of-way for public transport across either Commonwealth Avenue or Kings Avenue Bridge.



Figure 53 Concentrated Plan - Possible Metropolitan Road System

Table 53 Number of Lake Crossings Required : Concentrated Plan

	Minimum Number of Lanes in Each Direction
Tuggeranong Parkway	3
Commonwealth Avenue	3
Kings Avenue	2
Eastern Parkway	2
New Lake Crossing	2
Total	12

The third lake crossing of Lake Burley Griffin could be expected to relieve existing pressures in the vicinity of State and Capital Circles.

Construction of this additional lake crossing would also involve upgrading of Yarra Glen arterial and the resumption of a right-of-way through Yarralumla to the lake. On the northern side of the lake, special road arrangements would be necessary, including a direct connection with the Molonglo Arterial and a new facility providing access into Civic. A new access road would be essential as improvements to existing facilities would result in the equivalent of a ten lane section of road (Parkes Way between the new lake crossing and Commonwealth Avenue). Even so, there is considerable doubt that the internal distributor road system in Civic could handle the traffic demands. In addition, recent developments have eliminated most opportunities for such a new access road at surface level.

(b) Tuggeranong Roads

The further development of Tuggeranong, to a population level of about 89 000, would require the construction of one new major road corridor to the north, and major improvements to existing roads servicing the Tuggeranong Valley. If no major employment centres are provided locally, the estimated peak-hour demands out of Tuggeranong would require the equivalent of ten parkway lanes. The majority of travel would be to Woden and the Central Area. Although the Tuggeranong Parkway could be easily upgraded, the east-west links to main distributors are highly constrained (Hindmarsh Drive and the Molonglo Arterial). The construction of the Eastern Parkway to at least a dual three-lane facility is considered essential to this option. Major roads and their desirable capacity to service Tuggeranong needs are shown in Table 54. As can be seen from the table all existing roads including Athllon Drive and the Monaro Highway will require duplication.

Table 54 Roads Required to Service Tuggeranong at a Population of 89 000 : Concentrated Plan

	Minimum Number of Lanes in Each Direction
Tuggeranong Parkway	3
Athllon Drive	2
Erindale Drive	2
Eastern Parkway	3
Monaro Highway	2
Total	12

(c) Gungahlin Roads

The future development of Gungahlin to a population exceeding 80 000 would require the construction of at least two major roads, providing connections to Civic and the main inter-town road network.

The alignment of the new roads was assumed in the evaluation to generally foilow the routes of John Dedman Parkway and Monash Drive. It was estimated that capacity equivalent to nine parkway lanes

would be required to service the peak-hour demands out of Gungahlin. The proposed distribution of road space is shown in Table 55.

Table 55 Roads Required to Service Gungahlin at a Population of 84 000 : Concentrated Plan

	Minimum Number of Lanes in Each Direction
Northbourne Avenue	1
Monash Drive	3
John Dedman Parkway	3
William Slim Drive	2
Total	9

The analysis indicated that Northbourne Avenue would be almost at capacity without any contribution from Gungahlin, due to population increases in Kaleen and North Lyneham and greater demands generated by existing suburbs, because of increased employment opportunities in the Central Area. It was assumed, therefore, that the existing geometry of Northbourne Avenue would be retained and that grade separation at interchanges was not feasible. However, some improvement in capacity was assumed to be possible by the introduction of improved traffic management techniques.

It was also assumed that access to Monash Drive would be strictly controlled to protect the residential amenity of inner North Canberra suburbs. It would have direct connections with Ainslie Avenue (to Civic) and the Eastern Parkway.

John Dedman Parkway would be a northern extension of the proposed new lake crossing. Although it would provide some degree of access to Civic, its primary function would be that of a Civic by-pass road. The Parkway would require a minimum three lanes in each direction over the whole of its length, (from Gungahlin to Parkes Way), and access would need to be controlled. However, it was assumed that there would be grade separated interchanges with all major east-west roads.

To provide for most of the Gungahlin to Belconnen Town Centre travel demand, William Slim Drive would require duplication and realignment east of Lake Ginninderra to meet Aikman Drive. The remainder would use John Dedman Parkway and either Ginninderra Drive or Belconnen Way.

(d) Other Improvements

Other major improvements would be required for existing roads under the development implied by the Concentrated Plan. The main ones are:

- further development of the Glenloch Interchange and realignment of Caswell Drive
- duplication of Bindubi Street, Caswell Drive and William Hovell Drive
- an extra lane and intersection modifications on Belconnen Way/Barry Drive from Coulter Drive to Northbourne Avenue
- improved capacity on Parkes Way
- duplication of the Cotter Road
- grade separation of Hindmarsh Drive in the vicinity of Woden Town Centre
- additional capacity on the Molonglo Arterial (minimum of three lanes in each direction).

Dispersed Plan

The scale of roads which would be required under the Dispersed Plan is shown in Figure 54. The main features to note are as follows.

(a) Third Lake Crossing

The Dispersed Plan is not dependent on the need for a third bridge across Lake Burley Griffin although it would provide substantial benefits.

The reduced Central Area employment, combined with wider dispersal of employment opportunities (five town centres instead of three), would result in a significant reduction in traffic crossing from either side of the lake. The analysis indicated that less than nine equivalent parkway lanes would be required. The resulting distribution of road capacity is shown in Table 56.

In the event of a substantial increase in mode split to the Central Area, bus priority measures would be required to improve public transport efficiency. While this would have a detrimental effect on motorists, the road system as proposed could still service the anticipated demands.



Figure 54 Dispersed Plan - Possible Metropolitan Road System

Table 56 Number of Lake Crossings Required – Dispersed Plan

	Minimum Number of Lanes in Each Direction
Tuggeranong Parkway	3
Commonwealth Avenue	3
Kings Avenue	2
Eastern Parkway	2
New Lake Crossing	-
Total	10

Due to the reduction in total road capacity across the lake, the effects of congestion on these roads would be considerably higher than under the Concentrated Plan. This would lower the average speed and result in longer trip travel times.

(b) Tuggeranong Roads

The road capacity required to service Tuggeranong would be considerably reduced, due to the relatively large concentration of employment assumed in the Tuggeranong Town Centre.

Whereas the equivalent of ten parkway lanes was considered a requirement under the Concentrated Plan, less than eight parkway lanes would be required for the Dispersed Plan. The distribution of road capacity is shown in Table 57.

Table 57 Roads Required to Service Tuggeranong at a Population of 89 000 : Dispersed Plan

	Minimum Number of Lanes in Each Direction
Tuggeranong Parkway	2
Athllon Drive	2
Erindale Drive	2
Eastern Parkway	2
Monaro Highway	1
Total	9

It was assumed that the Eastern Parkway would be constructed in preference to larger-scale improvements to the existing primary access roads. This would provide greater flexibility in the event of Tuggeranong’s population exceeding the currently proposed level, or in the event of some natural disaster or accident which might affect one or more of the roads. It would also be important if the desired level of local town centre employment could not be provided, or its timing, relative to population settlement, were significantly delayed.

A detailed design study is being undertaken on the alignment of the Eastern Parkway.

Only minor improvements would be needed to the Tuggeranong Parkway. However, both Erindale Drive and Athllon Drive would require duplication. Duplication of Monaro Highway would be desirable but not essential, as minor intersection treatments might suffice.

(c) Gungahlin Roads

For the future development of Gungahlin, the two new facilities proposed in the Concentrated Plan were also considered to be essential to the Dispersed Plan. However, it may be possible to reduce the John Dedman Parkway to a dual two-lane facility.

All other roads would be similar in scale to those identified for the Concentrated Plan, as indicated in Table 58.

Table 58 Roads Required to Service Gungahlin at a Population of 84 000 : Dispersed Plan

	Minimum Number of Lanes in Each Direction
Northbourne Avenue (from Antill Street to Federal Highway)	1
Monash Drive	3
John Dedman Parkway	2
William Slim Drive	2
Total	8

(d) Other Improvements

Most of the road improvements considered essential for the Concentrated Plan were considered to be desirable for the Dispersed Plan. However, in many cases, they could be omitted if an increased level of traffic congestion were accepted. Those works that were not considered to be essential included:

- Belconnen Way Barry Drive roadworks
- Parkes Way improvements
- Cotter Road improvements
- grade separation of Hindmarsh Drive.

It was evident from the analysis that both the John Dedman Parkway and Monash Drive would be essential for any development proposals for Gungahlin.

It was also evident that there is an ‘employment threshold’ for Civic above which the local road system in its current form would constitute a limiting factor. At the current level of mode split, this threshold is estimated to be about 25 000 employees. (This assumes that sufficient car parking would be available). Any increase beyond this, without a corresponding increase in public transport, would require additional roads into Civic. The problems might be overcome if adequate by-pass roads were possible around Civic. Currently, about 50 per cent of the traffic using the Civic road system is through-traffic, and the level of through-traffic can be expected to grow as Central Area employment grows. This study did not specifically assess the opportunity for Civic by-pass facilities. It was considered that the assumed level of Central Area employment did not warrant the added expense and impact of these roads. However, they are currently being investigated in a more detailed study of the Civic distributor road system.

Other road improvements considered essential, regardless of which planning option is pursued, include:

- further development of the Glenloch Interchange, because: major roads currently experience congestion during peak hours, current population infill at Belconnen and Weston Creek will exacerbate existing problems; and future employment at the Belconnen Town Centre will attract more traffic from the south
- upgrading of major roads to the Belconnen Town Centre including Bindubi Street, Caswell Drive and William Hovell Drive
- duplication of Athllon Drive, because the road is currently operating near its capacity and future development of Woden Town Centre will increase demands
- duplication and re-alignment of William Slim Drive, in conjunction with improvements to the capacity of Aikman Drive
- duplication of Erindale Drive and the Long Gully Road connection to the Eastern Parkway

- improvements to the capacity of Tuggeranong Parkway north of the Cotter Road, and improvements to the capacity of Monomah Arterial.

Comparison of the Alternative Plans

The evaluation also considered the effects that the options would have on travellers and network operations. It looked at five broad areas, namely:

- network efficiency - the ability of the network to respond to the projected travel demands
- the relative efficiency of the combined land use/transport plan
- environmental impacts
- the impacts of a significant increase in mode split
- total infrastructure costs.

Network Efficiency

Table 59 summarises various network performance indicators which were derived from the transport models.

Table 59 Comparison of Network Performance Indicators

Performance Indicator	Concentrated Plan	Dispersed Plan
Reverse Loading Ratio	0.313	0.371
Number of Highly Congested Road Links	32	18
Total No. of Trips	84 187	85 152
Total Distance Travelled	1.004 x 10 ⁶ km	9.823 x 10 ⁵ km
Total Peak Hour User Costs	\$3.1 x 10 ⁵	\$2.8 x 10 ⁵
Average Peak Hour User Cost	\$3.68	\$3.29

The ‘reverse loading ratio’ describes the extent to which the land use plan has been successful in making the best use of available road capacity by balancing the direction of travel, i.e. it looks at the amount of traffic travelling in each direction. Table 59 indicates that the Dispersed Plan would improve network efficiency by at least 18 per cent over the Concentrated Plan. This is reflected in the reduced number of ‘highly congested’ traffic links and the reduced scale of the total network as shown in the earlier tables. Network loadings in the Concentrated Plan are considerably higher than those currently existing.

The evaluation did not consider the internal distribution system at the major activity centres. It is evident that increasing the amount and density of employment at particular locations would have a marked effect on the adjacent street system and primary access roads.

It may be seen from Table 59 that the average distance travelled would be very similar under both Plans. The important considerations are the relative distances travelled by particular sections of the community (this is discussed in greater detail in the following section) and the distribution of travel demands.

Although the figures for average distance travelled are similar, there is a major difference between the Plans in relation to travel costs. In this analysis, average travel costs reflect the effects of both distance and time, and the values in Table 59 represent a generalised travel cost (both distance and time of each trip are weighted by an appropriate value and then combined). While the weighting may be the subject of some debate, it is the relative difference that is of importance. This analysis demonstrates that the Dispersed Plan would result in at least a 12 per cent saving when the effects are considered over, for example, a whole year. Most of this is attributable to more

balanced network loadings and higher average speeds due to the reduced levels of congestion under the Dispersed Plan.

It is expected that even greater savings would be achieved during the off-peak hours, although this was not the subject of detailed analysis. The wider dispersal of employment, retail, commercial and community activities under the Dispersed Plan means that more trips would be of a 'local' nature.

Relative Efficiency of the Combined Land Use/Transport Plan

Figure 55 shows the proportion of self-containment forecast for each town under the two Plans and their current levels of self-containment. Self-containment is defined as the number of trips which originate and terminate in the same town or district.

As can be seen, there is a significant difference in the distribution of travel demands under the Dispersed Plan. The degree of self-containment in the new towns is similar to that of the longer established areas. Under the Concentrated Plan, they would be seriously disadvantaged. The effects of the difference in distribution are also evident in the measures of relative travel costs for each of the towns (travel costs according to the generalised cost concept as discussed previously) as shown in Table 60.

Table 60 Relative Travel Cost

	Existing Situation (1982)	Concentrated Plan	Dispersed Plan	% Diff. between Dispersed & Con- centrated Plans
North Canberra	2.60	2.71	2.40	+ 13
South Canberra	2.28	2.67	2.49	+ 11
Belconnen	3.61	4.14	3.65	+ 13
Woden-Weston Creek	3.02	3.39	3.15	+ 8
Tuggeranong	4.01	5.21	4.15	+ 26
Gungahlin	-	4.87	3.87	+ 26

Table 60 shows that, while the magnitude of the travel costs may be questioned, it is the relative differences that are important.

As may be expected, both plan options would result in increased travel costs relative to the existing situation, due to the increasing size of the City. The Dispersed Plan would, however, tend to keep the increase to a minimum. Also, it would reduce the relative travel costs for all travellers and reduce the social inequities associated with longer journeys for the new towns of Tuggeranong and Gungahlin.

Environmental Impacts

A detailed environmental evaluation of the two Plans has not been conducted. However, a broad assessment confirms that the Dispersed Plan would appear to have less effect on the environment than the Concentrated Plan.

Air and heavy metal pollutants from motor vehicles are generally associated with large concentrations of vehicles. The Commission has identified several locations in Canberra where these pollutants have exceeded, or are currently approaching, the critical levels established by the World Health Organization. These include specific locations in Civic, Woden Town Centre and near other major activity centres. As Canberra continues to develop, conditions will progressively worsen. Future legislation may reduce the effects of these pollutants considerably. However, the lower concentrations of traffic in the major centres and the generally lower traffic volumes associated with



Figure 55 Proportion of Self-Contained Peak Hour Trips

the Dispersed Plan would result in lower levels of pollution than would exist under the Concentrated Plan.

Similarly, the lower traffic volumes associated with the Dispersed Plan would result in a lower incidence of noise pollution and reduced potential for traffic intrusion into residential streets. Examination of the network loadings for roads which are considered to be environmentally sensitive (i.e. have residential frontage) confirms that these adverse effects would be reduced considerably. Relative traffic volumes for some typical roads are shown in Table 61.

Table 61 Relative Traffic Volumes for Typical Roads

Location	Ratio of Network Loadings Dispersed : Concentrated
Beasley Street, Farrer	0.45
Kent Street, Hughes	0.96
Stonehaven Crescent, Deakin	0.74
Melbourne Avenue, Forrest	0.63
Macarthur Avenue, O'Connor	0.84
Limestone Avenue, Ainslie	0.97

The Concentrated Plan would have a more severe impact on the physical environment. First, an additional bridge across Lake Burley Griffin is considered essential to the Plan. It would necessitate the resumption of a right-of-way through Yarralumla to the lake and an extensive bridge crossing. Second, the scale of most of the new roads required to service Gungahlin and Tuggeranong would be substantially greater.

The Impacts of Increased Mode Split

In the absence of a political or economic event which may influence the availability of fuel for private vehicles, there is generally little possibility of an ‘across the board’ increase in mode split. It is likely, however, that mode split may increase for travel to particular destinations where parking is in short supply or is very expensive. The analysis indicates that this could be the case in Civic Centre and Woden Town Centre, and possibly in Belconnen Town Centre as well.

The effect of an (unlikely) increase of 100 per cent in mode split to these centres, from the existing 15-18 per cent to 30 per cent, was tested. In Civic, where the effects would be greatest, there would be a reduction of about 1 950 and 1 380 peak-hour terminating trips for the Concentrated and Dispersed Plans respectively. Although this should theoretically reduce the demand by the equivalent of up to three traffic lanes, it would have a negligible effect when distributed across all of the major access routes. Further, the sensitivity tests confirmed that the reduction in terminating vehicle trips would be almost totally displaced by through-traffic at the critical bridge links.

The combined effect of higher mode split to all town centres would be a reduction of 3 630 and 2 690 peak hour car trips for the Concentrated and Dispersed Plans respectively. This represents less than 5 per cent of the total peak-hour travel demand, and would be insignificant when distributed across the whole network. However, it does involve a greater than 100 per cent increase in commuter travel to, and between, the town centres by bus.

The Dispersed Plan would be able to cope with the increased demand by upgrading the transport system i.e. more express buses in conjunction with bus priority treatment at critical locations. Under the same mode split conditions, public transport demands associated with the Concentrated Plan were considered to have exceeded the threshold of existing public transport technology. It is likely that express buses or exclusive rights-of-way could be required on substan-

tial sections of the route. It would not, however, lead to a general reduction in road capacity since the reduced traffic demands would be more than offset by the additional requirements for public transport.

Investment in Major Roads

The analysis demonstrated that the Dispersed Plan would result in a significant reduction in capital investment for major roadworks. Table 62 provides an estimate of the total road-based infrastructure costs for both Plans at 1983 prices.

Table 62 Total Road Costs (1)

Road Types	Concentrated Plan		Dispersed Plan	
	Lane km	\$m	Lane km	\$m
Urban Arterial	189	105	143	71
Parkway	173	216	102	128
Total	362	320	245	200

(1) 1983 prices.

The major roadworks associated with the Concentrated Plan are estimated to cost about 60 per cent more than the equivalent road requirements of the Dispersed Plan. Also, if a special bus facility is provided, a further \$70 million (1983 prices) could be added to the cost of the Concentrated Plan (excluding the cost of vehicles).

Public Transport

Estimating Future Public Transport Patronage

During the next twenty years, it is expected that the public transport system will cater for about the same proportion of the total transport demand as it presently does, i.e. up to 9.5 per cent of daily vehicular trips. However, some spatial and distributional changes are likely.

Most of these changes will occur during the peak hour, and will be associated with increased employment density in the existing town centres.

Commuter travel by bus to the major activity centres may only increase significantly under certain conditions. These relate primarily to the cost and availability of parking, and the relative cost and standard of service of public transport. It is considered that the conditions conducive to a significant increase in mode split would be likely to exist only in Civic Centre and the Woden and Belconnen Town Centres.

The magnitude of the potential increase will depend on the following factors:

- public acceptance of parking restraint measures
- public acceptance of the substantial increase in the operating subsidy required for the public transport system
- the threshold before major investment is required for higher-technology (rail-type) systems or exclusive bus ways to service the demand or maintain reliability of service
- the timing of development and parking restraint measures.

Currently, the demand for parking is virtually unrestrained (charges for short-stay parking have been applied to ensure its availability for that use) and the annual public transport subsidy has, in the past, been relatively unchallenged. However, the shortage of

land available for surface parking in Civic Centre and Woden Town Centre and the certainty of an increasing annual public transport subsidy was considered in the estimate of future mode split.

A mode split to these centres of 30 per cent by public transport may therefore be the practical maximum. This represents an increase of up to 100 per cent over the existing peak-hour mode split. Mode split to most other major employment centres and other destinations is predicted to decrease slightly, due to:

- increasing car ownership
- no parking restraint
- the popularity of private cars
- increasing journey distances
- increasing value of leisure time
- greater propensity for combining trip purposes.

The public transport evaluation was, therefore, carried out with reference to both the current mode split and this higher mode split (i.e. 30 per cent).

The express bus operations (line-haul and discrete peak-hour express services) are considered to be the most critical components of the public transport system. They provide an inter-town travel service and currently account for approximately 30 per cent of peak-hour patronage (excluding special school buses). At present, they comprise the only part of the system that is operating at capacity.

The express services are also expected to experience the greatest amount of future growth. For the two plan options, it is estimated they will carry between 50 per cent and 55 per cent of the peak-hour passengers (excluding special or school buses). Express buses will also be most directly affected by traffic congestion.

It was assumed that local feeder services would be provided to all new suburbs at approximately the current level of provision. Most of the existing local services are operating at less than 60 per cent of their capacity during the peak hour (and less at other times). In most cases, any modest increase in peak-hour mode split could be readily absorbed. Experience has shown that any reduction in frequency of service to rationalise apparent over-supply in capacity has an adverse effect on patronage levels. Hence, the current standard of service was assumed as the minimum necessary to maintain or improve mode split. As most of their operation is local (within a suburb), they would be relatively unaffected by traffic congestion.

Since population settlement was identical for both plan options, and it was assumed that local feeder services would be provided at a standard to meet expected future demands, it was considered that the express services would be most affected by the different plan options. A more detailed analysis of express services was, therefore, undertaken.

To assess the implications of the plan options on public transport operations, future public transport travel demands were forecast.

Local feeder services with sufficient capacity were assumed to cater for all intra-district trips (i.e. where origin zone and destination zone are the same).

The remaining trips were assigned to a simplified network representing line-haul and some special express bus operations. From Woden, Belconnen and Civic, it was assumed that a discrete express service would follow the most direct route to its destination. This would not necessarily be a line-haul service. In the case of Tuggeranong and Gungahlin, the most direct route for most services passed through

Woden and Civic respectively, thus, the demands that could be satisfied by other express services were included in the line-haul volumes.

Evaluation of Future Public Transport Demands

Estimates based on the current mode split, of the peak-hour, line-haul passenger volumes for the Concentrated and Dispersed Plans are shown in Figure 56. This is considered to be the most likely situation in the absence of any direct policy to reduce car travel.

The analysis indicated that the total amount of inter-town travel on the line-haul system would be very similar for both Plans, i.e. about 52 per cent for the Concentrated Plan and 56 per cent for the Dispersed Plan. However, the Dispersed Plan is considered to offer a much more efficient public transport operation. First, the passenger loadings would have a better directional balance. The Concentrated Plan has a reverse loading factor of 0.18, compared to the Dispersed Plan with 0.47. Second, the magnitude of passenger loadings in the peak direction would be considerably less. The hourly volumes on some routes in the Concentrated Plan are more than double the equivalent Dispersed Plan route loading.

The combined effect of the reduced peak demand and more evenly balanced directional loading would result in a higher load factor per bus. This would reduce the total capacity required and, hence, would reduce the operating deficit.

The analysis also indicated that the Dispersed Plan would have approximately 30 per cent more single bus journeys. Most of the increase is due to the greater provision of local employment opportunities at Gungahlin and Tuggeranong. Single bus journeys are more attractive to passengers, because they do not involve transfer. However, they also imply greater utilisation of local feeder services and higher operating costs. As mentioned previously, feeder services are currently operating at less than 60 per cent of their capacity. Therefore, much of the increase could be absorbed. By increasing the proportion of local journeys, the Dispersed Plan would also reduce journey time and distance for those passengers with the greatest distance to travel. Inter-town loadings for Tuggeranong and Gungahlin would be reduced by 42 per cent and 32 per cent respectively.

If mode split were dramatically increased for commuter travel to the existing town centres from the existing range of 15-18 per cent to 30 per cent, the estimated line-haul passenger loadings would be as shown in Figure 57. The characteristics observed previously still apply. The directional balance would be slightly less for both Plans (reverse loading factor of 0.15 and 0.35 for the Concentrated Plan and Dispersed Plan, respectively). However, the difference in magnitude of the peak loadings for most routes would be increased. This would result in a significant increase in the fleet size needed to service the Concentrated Plan.

Even with the passenger loadings predicted under the high mode split conditions, it is considered that buses could cater for Canberra's future public transport needs. The analysis indicated that neither peak-hour nor daily passenger volumes would satisfy the minimum route loading conditions needed to justify light or heavy-rail technology. However, the analysis was not extensive enough to confirm the location of necessary bus-only lanes or exclusive rights-of-way for either Plan. The loadings indicate that bus priority facilities can certainly be justified under both plan options, although the need for facilities would be reduced under the Dispersed Plan. In relation to staging, this implies that the appropriate investment could be deferred, or alternatively, that a higher mode split could be absorbed.



CONCENTRATED OPTION



DISPERSED OPTION



Figure 56 Morning Peak Hour Commuter Volumes on Line-Haul Routes - Existing Mode Split

A further sensitivity test was performed to assess the implications of drastically reducing the supply of parking in Civic. It was assumed that a maximum of five parking structures would be constructed (these would accommodate about 5 000 vehicles). Under the Concentrated Plan, mode split to Civic would need to increase to more than 60 per cent. This would be about 50 per cent higher than Perth's mode split which has a population about four times that of Canberra and a much more concentrated central area. The estimated passenger loadings on the line-haul route from the north (combined Belconnen and Gungahlin) exceeded the capacity of a busway system and, consequently, the high front-end costs of rail technology were considered to be necessary under these conditions. The capacity of the existing City Bus Interchange would have been exceeded even at a reduced mode split.

Applying the same conditions to the Dispersed Plan results in a maximum mode split of 30 per cent, which constitutes the upper range of the earlier considerations on mode split.

The evaluation also revealed that the advantages of the public transport spine concept, which has been the basis of public transport planning in Canberra, would not be realised, unless there is a much greater change to public transport use than has been forecast, or unless Canberra continues to grow in a linear form. If Canberra does not continue to grow in a linear form, or alternatively, if future development involves a major infill programme, transport flows would be very different. Until the long-term future of Canberra is able to be defined in greater detail, suitable public transport corridors should be reserved to maintain planning flexibility. These corridors should extend between the town centres and to the 'edge' of any development where there is the possibility of further development.

The evaluation of future public transport needs and operations has been, of necessity, very limited. A major deficiency of the evaluation is the lack of a detailed economic or cost-benefit analysis as this would have required more detailed information than is currently available. It should be stressed that any planning initiatives which involve a significant change in mode split should be subjected to a comprehensive cost-benefit analysis before being implemented.

An Overview of the Proposed Metropolitan Public Transport System

The existing line-haul and feeder strategy will be extended to the new towns of Tuggeranong and Gungahlin as they are developed. Public transport interchanges, similar to those at the existing town centres, will be essential. During the interim stages of development, they can be temporarily located, but ultimately they should be integrated into the local town centre.

New line-haul express services operating between Tuggeranong and Woden, Gungahlin and Woden, Gungahlin and Civic, and Gungahlin and Belconnen, will be integrated into the system. It has been assumed that no special express services will be operated from Gungahlin or Tuggeranong and that the demand for these services will be added to those currently operating from Civic and Woden. However, if sufficient demand were demonstrated, they could easily be implemented.

During the interim stages of development, line-haul services can be operated in mixed traffic, and on those routes which will provide a satisfactory standard of service at minimum cost. Generally, public transport will be given priority over other vehicles at intersections or along sections of road where delays may be significant. However, when passenger volumes reach a threshold which warrants improved facilities, (e.g. bus-only lanes or exclusive rights-of-way), the required improvements should be incorporated within the appropriate section

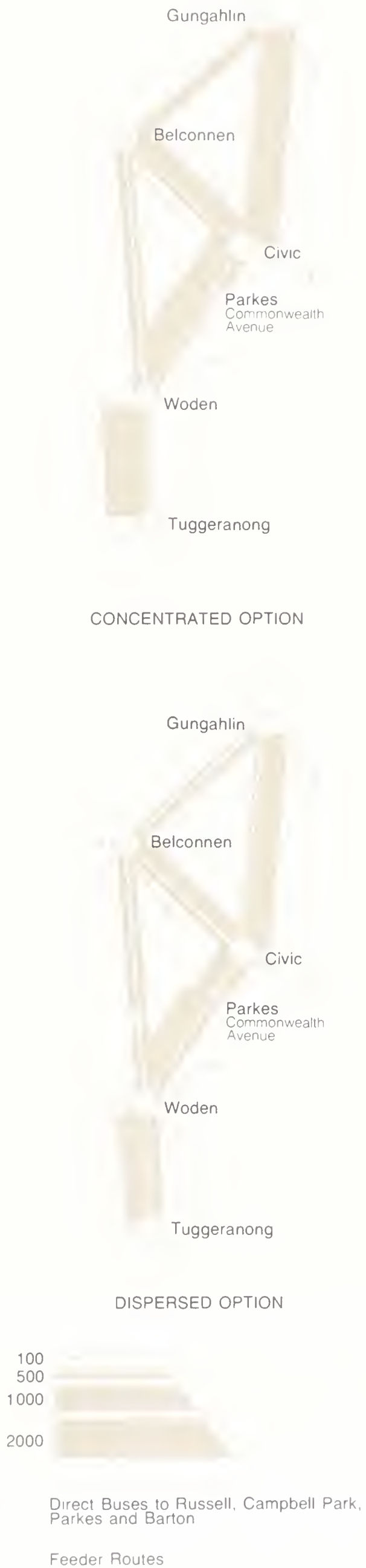


Figure 57 Morning Peak Hour Commuter Volumes on Line-Haul Routes - High Mode Split

of reserved corridor. Similarly, when traffic congestion reaches levels which substantially reduce the reliability of services or terminal capacity, improved corridor facilities should be implemented.

It is anticipated that local bus services will be provided to all new suburbs. In general, they will operate between a particular suburb and the local town centre. However, because of the central location of the interchange, some local services will also provide a service to adjacent town centres (a similar situation already exists). It is expected that the standard of service will be similar to that existing. A fast, frequent and reliable service will be provided within about 400m walking distance of most residences.

It is proposed that a public transport corridor linking all of the existing and future transport interchanges be reserved to accommodate the longer-term development of Canberra, or future unforeseen circumstances, which may affect mode split to such an extent that a higher technology public transport system is needed. The corridor should follow the most direct and feasible alignment. A preliminary route is identified in Figure 58, although this will be the subject of a more detailed assessment.



Figure 58 Inter-Town Public Transport Route

Centres Evaluation

Introduction

Any comparison of options involving the system of centres in Canberra must take into account a wide range of factors. The objectives set for the City need to be met and the centres should also contribute to the attainment of a dignified National Capital, with an efficient urban structure and an environment which fulfils the aspirations of both residents and visitors.

The capacity of the centres to accommodate existing and proposed development efficiently also has to be assessed. Over-development creates cost penalties, which are manifest in the need to provide extensive car parking structures and to upgrade the internal road system or to accept congestion on the roads within the centre, and can impose redevelopment pressures. On the other hand, under-development fails to realise the full potential of a centre and neither completely uses the investment in services nor supports the existing facilities established in the centre.

The capacity of the arterial network providing access to the centre has to be considered to ensure that the centres do not grow to a size which causes congestion on the metropolitan road system or creates a need for additional arterial roads. Finally the incremental growth of the centres needs to be monitored to ensure that they do not usurp the role of new centres, containing shops and facilities which better meet the local needs of developing areas.

The centres evaluation takes into consideration the following thresholds and comparisons:

- the capacity of the unconstrained vacant land in the centres to accommodate new buildings and car parking at the existing intensity of development
- the capacity of the vacant land at an increased intensity of development, assuming the existing public transport patronage rates (mode split). The feasibility of increasing mode split to 30 per cent has not been investigated in detail. The implications for the bus deficit could be significant and an analysis of such a strategy should be carried out before any campaign to increase the use of public transport is undertaken
- the capacity of the arterial system serving the centre
- the capacity of the arterial road system after possible improvements such as duplication where appropriate and the construction of overpasses and other methods of improving the flow at intersections. These thresholds are not absolute. The highest threshold will be achieved when public transport demand is high but when traffic congestion is sufficiently low not to require the reservation of bus-only lanes. The centres may be constrained at lower thresholds because: the internal distributor system does not match the access system; pedestrian activity or bus circulation increases, reducing the capacity of intersections; existing traffic lanes are dedicated for exclusive bus use for the inter-town public transport system; or because the metropolitan road system cannot supply adequate capacity to the roads accessing the centre
- constraints which should be placed on existing centres to enable the establishment of centres in the new settlement areas. These centres offer the opportunity to achieve a more efficient and equal distribution of shopping, employment, community and other facilities and services across the City
- the performance of the distribution of the retail floorspace and social and community facilities under the two Plans

Development Thresholds

Table 63 shows the extent of development and the vacant developable land in each of the main centres in 1982.

Table 63 Land Occupied by Development and Car Parking and Developable Vacant Land in Civic and the Town Centre Core Areas (1)

		Civic Centre	Woden Town Centre	Belconnen Town Centre
Developed Land	(ha)	33	15	19
	(%)	45	47	33
Car Parking	(ha)	24	13	18
	(%)	32	41	32
Vacant	(ha)	17	4	20
	(%)	23	12	35
Total	(ha)	74	32	57
	(%)	100	100	100

(1) Undevelopable vacant land and roads not included.

From this information and the employment levels in the core areas, it was possible to calculate the development threshold of each core area at the existing intensity of development. After this increase was combined with the potential increase due to development of vacant land in peripheral areas such as service trades areas, the threshold of the centre at the existing intensity of development was obtained. The extra employment potential in the Woden Town Centre is only achievable if vacant land to the east of the centre is utilised.

Table 64 shows the three main centres, which at present have a total employment of 33 000 between them, can accommodate only about another 10 000 to 14 000 employees at existing densities, compared with the additional 17 000 employees which are proposed to be located in them in the Dispersed Plan and 37 000 in the Concentrated Plan.

Table 64 Existing (1982) Employment Levels, Potential Increases and Employment Thresholds at the Existing Intensity of Development

	Civic Centre	Woden Town Centre	Belconnen Town Centre
Core			
Existing	14 000	7 700	6 800
Potential Increase	4 000	1 100 (3 800)	3 900
Other Areas			
Existing	2 000	1 600	1 200
Potential Increase	-	400	900
Development Threshold	20 000	10 800 (14 600)	12 800

Notes:
1. The figures in brackets for Woden are thresholds including the vacant land to the east of the stormwater channel.

The development potential of the centres was assessed by assuming that the development intensity on the remaining land would be increased so that on building sites the floor area of the development would be three times the area of the land on which the building was



Figure 59 Civic Centre - Core and Frame



Figure 60 Woden Town Centre - Core and Frame



Figure 61 Belconnen Town Centre - Core and Frame

sited at a plot ratio of 3.0. It should be noted that Hobart Place and other high-rise clusters in the existing centres have not reached this development intensity. Land occupied by low buildings and service pedestrian areas compensates for the intense development in tall structures.

In determining the possible employment levels in future buildings it was assumed that 7 out of every 8 workers would occupy about 20m² of space, the current gross floor area occupied by office workers. The other worker in 8 was assumed to be in hotels, cinemas and theatres, public buildings and entertainment facilities which are more extensive and where an employment density of 100m² per worker was assumed. Additional retail development was treated separately.

The nature of retail malls and other shopping facilities is such that, except where office towers are constructed over part of them, they are usually limited to two or three storeys and have a lower development intensity than office development. Consequently, new retail development was assumed to have a plot ratio of 2.0 in Civic and 1.5 in Woden and Belconnen Town Centres. Visitor parking for shopping and commercial facilities was assumed to be provided at an off-peak rate of 2.5 spaces per 100m² of retail space. In the Concentrated Plan, the 30 000m² of retail space in Civic and the 20 000m² in Woden and Belconnen Town Centres, provided in addition to the levels in the Dispersed Plan, reduce the capacity of the centres to accommodate offices. Consequently, the thresholds shown in Table 65 are approximately 1 500 lower for Civic and 1 000 lower for the town centres in the case of the Concentrated Plan.

Table 65 Existing (1982) Employment Levels, Potential Increases and Employment Thresholds at Increased Development Intensity

	Civic Centre	Woden Town Centre	Belconnen Town Centre
Core			
Existing	14 000	7 700	6 800
Potential Increase	5 000	1 500 (5 000)	7 100
Other Areas			
Existing	2 000	1 600	1 200
Potential Increase	-	700 (500)	1 700
Development Threshold	21 000	11 500 (17 000)	16 800

Notes:
1. The figures in brackets for Woden are thresholds including the vacant land to the east of the stormwater channel.

It is obvious from the table that the thresholds at the increased intensity of development are adequate for the Dispersed Plan in Woden and Belconnen Town Centres. The thresholds are, however, less than the employment levels tested in the Concentrated Plan.

The thresholds referred to above assumed that existing patterns of car usage would persist. If measures such as pricing for parking and restrictions on the supply of long-stay parking spaces were introduced, the thresholds may be slightly increased. A mode split of 30 per cent by bus was considered the maximum feasible, within the next twenty years, without major investment in public transport infrastructure and subsidy, and substantially increased parking restraint measures. The employment threshold of the centres with a 30 per cent mode split was estimated to be as follows: 29 000 for Civic; 17 000 for Woden and 30 000 for Belconnen. Even at this mode split,

the capacity of the centres is still below the total employment allocated to them in the Concentrated Plan.

Throughout the analysis, it was assumed that the intensity of development in the service trades areas would not increase substantially. The existing development density will be maintained and only vacant land will be occupied. The effects of a large increase in employment in these areas would be to reduce the capacity of major traffic arteries to the core areas, and in the case of Braddon, to cause traffic intrusion on residential streets. The development of service trades areas poses difficulties for the public transport services, and mode split to these areas is typically much lower. Development intensity in the service trades areas is also constrained by availability of land for parking. A major office development, for example, would result in significant local parking problems.

As a consequence of the shortage of land at centres and employment nodes, it was assumed that the provision of car parking at these nodes would be restricted to approximately 0.5 spaces per worker under the Dispersed Plan and 0.4 under the Concentrated Plan, compared with a current provision of 0.6 spaces per worker.

No detailed consideration was given to the threshold or capacity of the town centres in Tuggeranong and Gungahlin, since it was assumed that they would be planned with adequate land and adequate transport capacity. At present, there are no constraints which would limit their thresholds.

Transport Thresholds

The thresholds of the arterial network serving the centres were evaluated at two levels - the capacity of the existing network and the capacity of the network with a range of improvements.

Civic Centre

The potential capacity of the road system feeding into City Division, the core of Civic, was assessed. During the average morning peak hour in 1982, about 10 000 vehicles travelled in on these roads and approximately half travelled out, indicating that up to 5 000 vehicles terminated in the core during the peak hour. Based on current travel characteristics it was estimated that 6 out of every 7 of the terminating vehicles carried workers with the other being used for shopping, business or other activity not related to work.

In order to determine the employment threshold of the core at which the access road system reached capacity, it was necessary to determine first the transport capacity of the roads, in terms of vehicles per hour, and then make an allowance for through-traffic and terminating traffic not associated with work. The remaining vehicles were estimated to have carried workers and the capacity of the core could be assessed by reference to the proportion who drove cars to work.

The capacity of the road system providing access to Civic core was estimated to be approximately 14 500 vehicles per hour, if Coranderrk Street is duplicated and Monash Drive constructed.

Table 66 shows the capacity of the approach roads.

Through-traffic was assumed to increase by up to 20 per cent in response to a 25 per cent increase in Central Area employment. Civic's mix of activities is likely to continue in the future, as will the share of trips entering the area during the peak for purposes other than work. Table 67 shows an estimate of the approximate volumes for the various purposes. If the peak period extends to two hours, the roads accessing the core could service an employment of up to 25 000.

Table 66 Traffic Capacity of Civic Centre Approach Road

Road	Number of Lanes	Capacity (Vehicles Per Hour)
Barry Drive	3	2 300
Northbourne Avenue	3	2 400
Torrens & Associated Streets	1	500
Ainslie Avenue	2	1 500(1)
Coranderrk Street	2	1 500(2)
Constitution Avenue	1	800
Commonwealth Avenue	3	3 700
Edinburgh Avenue	3	1 800
Total	18	14 500

(1) Assumes Monash Drive.
(2) Assumes Duplication.

Table 67 Civic Centre Core: Relationship Between Employment Threshold and Access Capacity

Access Capacity	14 500 Vehicles per Hour
Through-Traffic	6 000 Vehicles per Hour
Terminating Traffic	8 500 Vehicles per Hour
Terminating Non-work	1 200 Vehicles per Hour
Terminating Work	7 300 Vehicles per Hour
Employment Capacity	25 000 Workforce

If the mode split increases, two countervailing circumstances can be expected. The employment threshold will increase and a point will be reached at which bus-only facilities will be required on Barry Drive, Commonwealth Avenue and Northbourne Avenue. If these are provided on existing road space, the capacity of access roads will be decreased by at least 1 800 vehicles per hour. The net effect of a doubling of the existing mode split to Civic, which was considered the highest mode split feasible under stringent controls, is that the employment threshold of the core would increase to about 27 000. At the extreme, if the bus-only lanes are added, for example, an additional lane to and across Commonwealth Avenue Bridge and a lane in the median of Northbourne Avenue, the employment threshold of the core could increase to approximately 34 000. This was considered most improbable. To determine the employment thresholds of Civic, the future employment of the Braddon Service Trades Area, estimated at 2 000 to 3 000, should be added.

The employment thresholds of Civic based on road access are summarised in Table 68.

Table 68 Civic Centre: Road Access Thresholds

Condition	Threshold
Existing Mode Split (15%), Full Road Network	27 000
100% Increase in Mode Split, Bus Lanes on Existing Roads	29 000
100% Increase in Mode Split, New Bus Lanes Constructed	36 000

The access road thresholds are, therefore, not likely to be the primary constraints on the development of Civic. The cost of parking structures and the traffic capacity of the internal distribution system are considered to be the main limiting factors.

Woden Town Centre

The highly accessible location of Woden Town Centre, at the intersection of the arterials serving Woden, Weston Creek and Tuggeranong, is responsible for limiting the capacity of the road system which accesses the centre. The arterial road network surrounding Woden Town Centre is serving a dual function of first, providing access to the town centre and second, carrying by-passing traffic from Woden and Tuggeranong moving north. In 1982, only one-third of the traffic on the road system was destined for the centre. Table 69 shows the estimated capacity of the arterial road system serving Woden Town Centre.

Table 69 Traffic Capacity of Woden Town Centre Approach Roads

Road	Number of Lanes	Capacity (Vehicles Per Hour)
Hindmarsh (West)	4	2 400
Melrose (North)	3	1 600
Athllon	2	1 000
Hindmarsh (East)	3	1 500
Launceston	1	800(1)
Melrose (South)	3	1 600
Launceston	2	1 000
Total	18	9 900
		Maximum Possible

(1) Residential Street.

Upstream capacity restrictions and the imbalance of demand, as the result of low demand from north of Woden Town Centre, were considered to reduce the access capacity to about 8 800 vehicles per hour.

An assessment of the current levels of terminating traffic and the current workforce in the core showed that fewer than 5 per cent of vehicles currently travel to Woden Town Centre for shopping and other non-work purposes during the peak. The 1982 levels of terminating non-work trips and car usage were assumed to persist, and it was assumed through-traffic would increase by no more than 5 per cent even though substantial increases were assumed in the population of Tuggeranong and in Central Area employment. The transport threshold of the core would be an employment level of approximately 10 700 as is shown in Table 70.

Table 70 Woden Town Centre Core: Relationship Between Employment Threshold and Access Capacity

Access Capacity	8 800 Vehicles per Hour
Through-Traffic	5 500 Vehicles per Hour
Terminating Traffic	3 300 Vehicles per Hour
Terminating Non-work	100 Vehicles per Hour
Terminating Work	3 200 Vehicles per Hour
Employment Capacity (Two-Hour Peak)	10 700 Workforce

The employment capacity of the core at 30 per cent mode split, which represents a doubling of the present rate, would be about 14 500. Such a high mode split could be expected only if parking was adequately controlled by charging for long-stay parking and prohibiting commuter parking in adjacent residential areas.

The capacity of the access roads could be increased by grade separating the intersections of Hindmarsh Drive and other minor roads between Melrose Drive and Ainsworth Avenue inclusive, at a tentative

order of cost of \$5 million. It was estimated that these road improvements could improve the access capacity to Woden Town Centre by up to 2 000 vehicles per hour and improve through traffic operations substantially.

The proportion of traffic which terminated during the peak hour for shopping and other non-work purposes can be expected to increase as the centre grows and a more complex mix of activities eventuates. On the basis that the proportion of non-work trips will be half of that now evident in Civic, it was estimated that when Woden Town Centre reaches Civic's current size, 400 vehicles per hour will arrive in the centre for non-work purposes.

Consequently, with major improvements, the arterial road system would have capacity to cope with about 5 200 terminating trips to Woden Town Centre, of which 4 800 would be work trips. Based on a two-hour peak and the current rate of car usage, the threshold for the town centre core would be 16 000. If the mode split increased to 30 per cent, the threshold would increase to about 21 800 employees. If bus-only facilities required for the higher mode split occupy road space, the threshold would be reduced.

In order to obtain the total employment thresholds for Woden Town Centre, the employment levels expected in the service trades area were added to the thresholds for the core. If substantial growth occurs in the service trades area, it would be at the expense of the capacity of the core, because both rely on the same arterials for access. The road access thresholds for Woden Town Centre, summarised in Table 71, are based on the assumption that employment in the service trades area grows to 2 500. Other thresholds, such as land availability and car parking, are not considered.

Table 71 Woden Town Centre: Road Access Thresholds

Condition	Threshold
Existing Mode Split and Road Network	13 200
100% Increase in Mode Split, Existing Road Network	17 000
Existing Mode Split, Major Improvements to the Road Network	18 500
100% Increase in Mode Split, Major Improvements to the Road Network	24 300

Notes:
1. The employment capacity of the Woden Town Centre, which includes the service trades area, is 2 500 higher than the equivalent capacity of the core area.

Belconnen Town Centre

The access threshold of Belconnen Town Centre, like the access capacity of Woden Town Centre, depends on the extent to which the arterial system is expanded to provide alternative routes for traffic, which would otherwise travel through the centre or compete with terminating traffic on roads adjacent to the centre.

Belconnen Town Centre, however, is different from Woden Town Centre when considered from the viewpoint of local traffic access. Major town arterials such as Belconnen Way, and Ginninderra, Haydon and Kingsford-Smith Drives by-pass the centre, yet others, such as Southern Cross Drive, Aikman Drive and Eastern Valley Way, terminate at the centre. Accordingly, it can be expected to have a higher transport threshold and to experience a growth in through-traffic until the access roads reach capacity.

In 1982, one car in three entering Belconnen Town Centre continued through. It was considered that approximately one car in twenty-five of the terminating traffic entered the centre for business, shopping or other non-work purposes. The remainder, slightly less than 2 400 vehicles, were work trips.

The 1982 access capacity of the town centre was estimated at below 10 000 vehicles per hour. When Gungahlin development occurs, Aikman Drive will require duplication to meet the needs for access between Gungahlin and Belconnen Town Centre. In addition, the intersection of Coulter Drive with Nettlefold Street could be improved to accommodate increased access from northern and western Belconnen. The future access capacity of Belconnen Town Centre would then be approximately 11 000 to 11 500 vehicles per hour (Table 72).

Table 72 Traffic Capacity of Belconnen Town Centre Approach Roads

Road	Number of Lanes	Capacity (Vehicles Per Hour)
Benjamin Way	2	2 000
Nettlefold Street	2	1 500
Luxton Street	3	3 000 4 500(1)
Joynton Smith Drive	2	2 000
Aikman Drive	2	2 000
College Street	1	800
Eastern Valley Way	2	2 000
Total	14	11 300

(1) The capacity on these roads depends both on the upstream capacity and on the demand from the areas of Belconnen which use the roads.

Through-traffic is expected to grow in proportion to the general growth of traffic to Belconnen Town Centre for several reasons. The town centre is surrounded by other employment nodes such as the Bruce TAFE, CCAE, Calvary Hospital and the proposed Canberra Technology Park. For some travellers, the quickest route to these destinations will always be through the town centre. Others will drop passengers at the town centre on their way to other destinations, such as Civic. Because Southern Cross and Aikman Drives and other arterials terminate at the town centre, a through-route will be the shortest path for some trips.

If the 1982 proportion of terminating non-work trips persists as the centre grows, and the level of car usage remains constant, the transport threshold of the Belconnen Town Centre, including the service trades area, is estimated to be an employment level of approximately 23 000 as is shown in Table 73.

Table 73 Belconnen Town Centre: Relationship Between Employment Threshold and Access Capacity

Access Capacity	11 300 Vehicles per Hour
Through-Traffic	4 000 Vehicles per Hour
Terminating Traffic	7 300 Vehicles per Hour
Terminating Non-Work	300 Vehicles per Hour
Terminating Work	7 000 Vehicles per Hour
Employment Capacity (Two-Hour Peak)	23 000 Workforce

If Arkman Drive is duplicated, and a mode split of 30 per cent is achieved, the employment capacity of Belconnen Town Centre would be 30 000. Accordingly, the road system is not the constraining threshold on Belconnen Town Centre. Other constraints, such as the availability of land for development and car parking, and the need to decentralise development to the other towns to achieve balanced metropolitan growth, are more likely to restrict the size of the centre.

Urban Structure

A major strength of Canberra’s urban structure is its system of centres. Combined with the transport network, they produce a relatively efficient and congestion-free city, despite its apparent widespread character. Other cities, such as Perth and Brisbane, have proposed subsidiary centres in their strategic plans, in order to achieve some of the benefits Canberra already experiences.

The continuation of the system of town centres would have the following advantages:

- reduce construction costs for new metropolitan roads and structured car parks
- reduce travel and car operating costs and air quality problems in Civic and the Central Area
- limit the increase of the public transport deficit
- provide opportunities to achieve a more equitable distribution of shopping, community and other facilities and services across the City.

To achieve this dispersal, decentralisation of employment and other activity needs will be required and the growth of existing centres will have to be constrained. In order to determine the broad level of the constraints which would have to be imposed on existing centres, approximate thresholds were established based on the following assumptions:

- providing job opportunities for 60 per cent of the workers who reside in the town to work in the town. This would be achieved by providing opportunities in the town centre, local areas, and adjacent industrial estates, and
- recognising that the remaining 40 per cent of workers would, for a wide variety of reasons related to job advancement opportunities, choice of housing and environment, prefer to work at other metropolitan employment locations and accept a large journey to work by cross-commuting.

In order to achieve the level of decentralisation of employment proposed, Central Area employment has to be limited to approximately 65 000 and Civic to approximately 25 000 employees. The town centre thresholds established, town populations and other employment in the towns are shown in Table 74.

Table 74 Decentralisation of Employment and Town Centre Thresholds

	Eventual Population	Resident Employees	60% Employment Containment	Local Employment	Industrial/ Special Use Employment	Town Centre Threshold
Woden-Weston Creek	60 000	27 300	16 380	7 030	-	9 350
Belconnen	83 000	37 800	22 700	5 950	3 000	13 750
Tuggeranong	89 000	40 500	24 000	5 500	4 000	14 500
Gungahlin	84 000	38 200	22 900	4 600	4 300	14 000

Capacity of Other Employment Areas

The Central Area is the main employment area in Canberra within which are several nodes including Civic and Parkes/Barton. Because the major metropolitan road system focuses on the Central Area, the employment threshold is inextricably linked to the performance and capacity of the metropolitan transport system, which is discussed elsewhere. In general, it is assumed that further development of individual nodes will be limited first, to the capacity of the access roads, except where these roads can be economically upgraded, and second, to the capacity of the land available to accommodate buildings and car parking. The analysis suggests there are no immediate constraints on any major node, although their cumulative growth has implications for the metropolitan road network. For example, there is sufficient land available in Parkes/Barton to double the existing levels of employment (to a total of over 20 000). This includes 3 000 jobs to be located in the Parliamentary Zone and the development of York Park for offices and extensive car parking. The estimated car parking demands at the existing rates of car usage, for the individual employment nodes in the Central Area (excluding Civic) in the two options are shown in Table 75.

Table 75 Estimated Car Parking Demands in the Central Area (excluding Civic Centre)

	Concentrated Plan		Dispersed Plan	
	Employment	Car Parking	Employment	Car Parking
ADFA/Duntroon & Campbell Park	5 300	3 200	5 300	3 200
ANU/CSIRO/Hospital	8 100	4 800	8 100	4 800
Anzac Parade/Braddon	3 300	2 000	3 300	2 000
Parkes/Barton	18 600	10 000	15 000	9 000
Russell	7 600	4 600	7 600	4 600

Comparison of the Centres in the Options

Development and Access Capacity

The development proposed for the centres in both options is such that desirable thresholds are exceeded. Consequently the construction of new access roads, multi-level car parks and higher density development and redevelopment will be required. Other factors which may influence the decisions to build structured car parking are related to convenience of access and physical or environmental constraints. Distances of over 200 m for short-stay parking and over 500 m for long-stay car parking reduce the use and acceptability of those spaces. Factors which militate against structured car parks are their initial capital costs and visual impacts.

Civic Centre

In the Dispersed Plan Civic Centre has an employment level of 25 000. Under this proposal all the developable land will be occupied, and some redevelopment will be required. Furthermore, at the existing mode split at least 5 000 car parking spaces will have to be accommodated in structures and up to six hectares of additional land would have to be made available for parking.

In order to avoid the unsightly appearance of car parking along the major approach roads and from the Parliamentary Zone, it may be necessary to restrict the areas of surface parking to their existing extent. Under these circumstances and assuming existing mode split, up to 8 000 spaces will have to be accommodated in structures. With a mode split of 30 per cent - an extreme situation - and no increase in the area available for car parking, over 3 000 spaces will have to be incorporated in structures. Thus between 4 000 and 8 000 cars will

have to be accommodated in parking structures under the Dispersed Plan, depending on the level of public transport patronage and the controls placed on the supply and use of car parking. These would need to be constructed incrementally over the twenty years of the plan period. An employment level of 25 000 is essential if the practice of decentralisation is to continue.

In contrast, Civic under the Concentrated Plan would exceed all the thresholds considered and major intervention and reconstruction would be required, if the proposed employment level of 35 000 was reached. Extensive redevelopment would also be essential. The Commission would no longer be able to assist in the release of vacant sites, and development would be totally reliant on lessees applying to redevelop their existing buildings.

Depending on the level of bus use between 11 000 (at 30 per cent mode split) and 18 000 (at 15 per cent mode split) car parking spaces will be needed in structures. The cost of parking structures will be at least \$50 million higher than under the Dispersed Plan at the same level of mode split. Such a level of provision will be difficult to achieve in the twenty years of the plan period (Table 76).

Table 76 Civic Centre: Parking Demands and Thresholds

	Concentrated Plan		Dispersed Plan	
	15% Mode Split	30% Mode Split	15% Mode Split	30% Mode Split
Total Parking in the Core	22 200	17 000	15 500	11 800
Number of Parking Spaces in Structures	18 000	11 000	8 100	3 200
Cost of Structures (\$ millions)	110	70	50	20
Thresholds Exceeded	All	All	Existing development intensity Increased development intensity	Existing development intensity

Even at a mode split of 39 per cent, (the current rate to the CBD of Perth), Civic would still require over 8 000 spaces in structures under the Concentrated Plan. The City of Perth is currently twice the size Canberra will be at the end of the plan period. Also, it is estimated that between 1 500 and 2 000 of the existing surface spaces would be lost to development. At a higher mode split, the bus interchange would have to increase in size substantially and additional bus priority measures would have to be introduced to maintain the reliability of the bus service.

The main arterial road system providing access to Civic will be deficient under the Concentrated Plan. An additional arterial road will be needed, but no obvious alignment presents itself. In this context, it was considered worthwhile comparing the current proposals for Civic with the 1962 proposals (Figure 62), which envisaged a dominant Civic Centre with an employment of approximately 40 000 when the metropolitan population grew to 500 000. When the City's population reached 400 000, the employment level in Civic was to be about 35 000. It implied mode split to Civic would be similar to existing levels.

The 1962 Plan also made provision for 18 car parking structures which, at 1 000 spaces per structure, was similar to the requirement determined for a 15 per cent mode split. In addition, the Plan included two high capacity, peripheral distributor roads with grade-separated intersections. The current analysis confirmed these roads would be



■ Parking Structures



Figure 62 The 1962 Plan for Civic Centre Development

required under the Concentrated Plan. The internal distribution system will also require upgrading to support the increased number of buildings and to access the many structured car parks.

A Civic Centre of 35 000 would severely constrain the extent to which employment could be dispersed to new settlement areas.

Woden Town Centre

In the Dispersed Plan, Woden Town Centre would be fully developed west of the stormwater channel. One car parking structure with a capacity of up to 1 500 spaces may be required depending first, on the extent of bus travel, and second, on the availability of suitable land for surface parking. Little additional land can be earmarked for parking in the core area. If development extends to the eastern sector, car parking could be provided south of the Woden TAFE, removing the need for structured parking.

No major roadworks would be required except possibly the realignment of Athllon Drive into Callam Street.

The size of Woden Town Centre under the Dispersed Plan will enable the policy of decentralisation to continue, by facilitating the establishment of a town centre in Tuggeranong. A constrained size will ensure that Woden Town Centre does not compete unduly with Civic Centre.

Under the Concentrated Plan, Woden Town Centre will fully occupy Woden East and require between 1 500 (30 per cent mode split) and 2 700 (15 per cent split) car parking spaces in structures depending on public transport usage (Table 77). The cost of car parking structures would be \$10-\$15 million higher than for the Dispersed Plan.

The extended area of the town centre, including Woden East, will result in unacceptable walking distances and less support for the facilities in the core from the more remote office workers. A further implication of an extended town centre is that public transport usage would be lower in Woden East than in the core area. A comparison of the commuter mode split to Braddon (8 per cent) and to Civic (16 per cent) shows the decline in the usage of buses as the distance from the centre, the public transport interchange and the location of high quality services increases.

Table 77 Woden Town Centre : Parking Demands and Thresholds

Woden	Concentrated Plan		Dispersed Plan	
	15% Mode Split	30% Mode Split	15% Mode Split	30% Mode Split
Total Parking in the Core	10 800	8 400	6 800	5 300
Number of Parking Spaces in Structures	7 000	3 000	1 500	-
Cost of Structures (\$ millions)	40	20	10	-
Thresholds Exceeded	Decentralisation	Decentralisation	Decentralisation	Decentralisation
	Existing and increased development intensity	Existing and increased development intensity		
	Arterial Access	Arterial Access		
Woden (including Woden East)	15% Mode Split	30% Mode Split	15% Mode Split	30% Mode Split
Total Parking in the Core	10 800	8 400	6 800	5 300
Number of Parking Spaces in Structures	2 700	1 500	-	-
Cost of Structures (\$ millions)	15	10	-	-
Thresholds Exceeded	Existing and increased development intensity	Existing development intensity	Decentralisation	Decentralisation
	Arterial Access	Arterial Access		

If the town centre is kept to the west of the stormwater channel between 3 000 (30 per cent mode split) and 7 000 (15 per cent mode split) car parking spaces will have to be located in structures, at a cost of between \$15-\$40 million.

The Woden Town Centre, as proposed under the Concentrated Plan, will require major arterial road improvements, unless the public transport usage can be increased. Hindmarsh Drive will need to be grade separated from Melrose Drive, Botany Street and Athllon Drive at an approximate cost of \$5 million. The bus interchange will also require upgrading and bus-only lanes will be needed through the centre.

Belconnen Town Centre

Under the Dispersed Plan, Belconnen Town Centre will not be fully developed. In theory, all the car parking demands could be accommodated on-surface. However, the structure of the centre is such that unacceptable walking distances would arise unless at least one structure is provided.

In the future, land opposite the lake front will become a stronger focus for development and can be expected to generate high parking demands. No significant car parking sites will be available, either because the slope of the land renders them impracticable, or the location, for example the lake edge, is unacceptable for both visual and environmental reasons. Accordingly, major surface parking could be accommodated only at distances approaching a kilometre from the point of demand. Short-stay parking should be provided within about 200 m of the facilities being served. The acceptability of long-stay parking diminishes, if it is over 500 m from the point of demand. In order to ensure a continuous development frontage in the vicinity of Lake Ginninderra, up to 1 500 parking spaces will be required in structures, in addition to the existing car parking structures.

Under the Concentrated Plan, Belconnen Town Centre will be developed in excess of the capacity of the available land and redevelopment pressures can be expected. Between 1 500 (at 30 per cent mode split) and 3 000 (at 15 per cent mode split) additional car parking spaces will be required in structures at a cost of \$10 to \$20 million (Table 78). No additional arterial road capacity will be required for

Table 78 Belconnen Town Centre : Parking Demands and Thresholds

	Concentrated Plan		Dispersed Plan	
	15% Mode Split	30% Mode Split	15% Mode Split	30% Mode Split
Total Parking in the Core	10 600	8 200	8 300	6 400
Number of Parking Spaces in Structures	3 000	1 500	1 500	-
Cost of Structures (\$ millions)	20	10	10	-
Thresholds Exceeded	Decentralisation Existing and increased development intensity	Decentralisation Existing and increased development intensity		

Belconnen Town Centre, other than the duplication of Aikman Drive, which will be needed under both plan options to provide access for Gungahlin residents.

Retail Evaluation

The distribution of retail floorspace between towns and between hierarchy levels needs to consider factors such as the accessibility of consumers to retail facilities, the impact of new centres on existing centres, changes in the retail industry such as larger supermarkets and discount store retailing and the impact of these trends on the spacing of centres.

The Concentrated and Dispersed Plans were tested on the basis of the following key assumptions:

- a metropolitan provision of 1.43m² per capita, which assumed no growth in Fyshwick or Queanbeyan both of which have considerably lower turnovers than the metropolitan average
- between 43 per cent and 50 per cent of retail expenditure would be attracted to town centres
- the per capita retail expenditure would be maintained in real terms
- work-based expenditure at town centres would be maintained
- no allowance was made for non-Canberra resident expenditure. In 1980, there was an estimated inflow of \$38 million to the ACT of which about \$7.3 million was spent at Civic, \$6.8 million at Woden Town Centre and \$4.7 million at the Belconnen Town Centre. As such, town centre turnover is likely to be understated in both options
- in the Concentrated Plan, the expanded group centres in Tuggeranong and Gungahlin were assumed to trade at \$1 500 per m² (1980 levels). They are expected to trade above this level, given the proposed town populations. As such, the trading levels at the existing town centres may be slightly overstated
- turnover per square metre and ‘retail’ floorspace includes that portion of service trades floorspace in which retail sale of goods occurs.

Concentrated Plan

Under the Concentrated Plan, the floorspace provided and the average turnover per square metre of floorspace at each of the town centres would be as shown in Table 79.

The expenditure per square metre at each of the town centres would be above the 1980 average trading level of \$1 310 per m² with the exception of Civic. Although Civic’s trading levels would be assisted by the inflow of non-resident expenditure, a provision of 110 000m² appears excessive. For Civic to trade at \$1 350 per m² , its level under the Dispersed Plan, the provision would need to be reduced to 102 000m² .

Table 79 Retail Floorspace and Turnover: Concentrated Plan

Centre	Floorspace (m ²)	Expenditure Per Square Metre (1980 Dollar Value)
Civic Centre	110 000	1 190 - 1 250
Belconnen Town Centre	90 000	1 320 - 1 420
Woden Town Centre	90 000	1 500 - 1 680
Gungahlin Town Centre	18 000	1 500
Erindale Centre	21 000	1 500

Woden Town Centre already trades at a level substantially above other centres, a result of the lower level of floorspace provision in Tuggeranong.

At 1980 Woden Town Centre trading levels, the floorspace supportable at each of the centres given that the level of floorspace at the major centres in Tuggeranong and Gungahlin would be fixed at 21 000m² and 18 000m² respectively, would be as shown in Table 80.

Table 80 Retail Floorspace Supportable: Concentrated Plan(1)

Centre	Floorspace (m ²)
Civic Centre	87 000 - 92 000
Belconnen Town Centre	79 000 - 85 000
Woden Town Centre	90 000 - 101 000

(1) At 1980 Woden Town Centre turnover levels.

Dispersed Plan

The floorspace provided and the estimated turnover per square metre of floorspace under the Dispersed Plan would be as shown in Table 81.

Table 81 Retail Floorspace and Turnover: Dispersed Plan

Centre	Floorspace (m ²)	Expenditure Per Square Metre (1980 Dollar Value)
Civic Centre	76 000	1 320 - 1 350
Belconnen Town Centre	70 000	1 400 - 1 450
Woden Town Centre	70 000	1 430 - 1 470
Gungahlin Town Centre	47 000	1 210 - 1 440
Tuggeranong Town Centre/ Erindale Centre	64 000	1 270 - 1 490

The upper turnover figure is probably a better estimate with the possible exceptions of Civic Centre and Woden Town Centre, which have large group centres in their catchments. In 1980, Inner Canberra residents spent only about 40 per cent, and Woden-Weston Creek residents spent only about 43 per cent of their retail expenditure at the town centre level, primarily as a result of the group and local centre provision in these districts. However, the inflow of tourist and other non-resident expenditure will assist the trading levels of Civic Centre and Woden Town Centre. In Tuggeranong and Gungahlin, the likely lower provision at the group and local level will result in a higher-than-average proportion of expenditure occurring at the town centre level. In Belconnen, where the provision at the group and local level is about 0.37m² per capita, the town centre attracted over 50 per cent of expenditure in 1980.

The upper expenditure range for each of the town centres is expected to be above the 1980 Canberra average turnover at town

centres of \$1 310 per m², but below that experienced by Woden Town Centre in 1980. At trading levels equivalent to those in Woden Town Centre in 1980 (\$1 500 per m²), the floorspace supportable at each of the centres would be as shown in Table 82.

Table 82 Retail Floorspace Supportable: Dispersed Plan(1)

	Floorspace (m ²)
Civic Centre	67 000 - 68 500
Belconnen Town Centre	65 500 - 67 500
Woden Town Centre	66 500 - 68 500
Gungahlin Town Centre	38 000 - 45 000
Tuggeranong Town Centre/ Erindale Centre	54 000 - 63 500

(1) At 1980 Woden Town Centre turnover levels.

The benefit to retailers and developers of having each of the centres trading at a rate equivalent to the 1980 Woden Town Centre level needs to be weighed against the additional benefit of increased floorspace for the residents of the new towns. The determination of appropriate trading levels needs to take into account such factors as Canberra's high turnover per square metre, its floorspace provision per capita relative to the State Capitals, comparative rents and other costs.

Comparison of the Plans

The Concentrated Plan, through its restriction of floorspace in both Gungahlin and Tuggeranong, would impose additional accessibility costs on the residents of these districts. Those benefitting most from this strategy would be the developers and lessees of the expanded group centres in Tuggeranong and Gungahlin, and the developers and lessees at the existing centres (Table 83).

Table 83 Retail Floorspace Per Capita (m²)

	Concentrated Plan	Dispersed Plan
Inner Canberra (1)	3.35	2.81
Woden-Weston Creek	2.03	1.71
Belconnen	1.44	1.21
Tuggeranong	0.55	1.00
Gungahlin	0.56	0.91
Queanbeyan	1.33	1.33

(1) Includes Fyshwick.

One possible benefit to consumers at the centres under the Concentrated Plan could be that, because some of the centres would be larger, a greater range of merchandise might be made available at these centres.

The Dispersed Plan proposes retailing opportunities in Tuggeranong and Gungahlin at a level comparable to the other towns, thereby improving residents' accessibility to retail opportunities. The development of the Tuggeranong Town Centre would reduce pressures for the expansion of Woden Town Centre whilst at the same time assisting Civic's metropolitan centre role. As a consequence the Dispersed Plan is preferred.

The functional mix of stores at the Tuggeranong and Gungahlin Town Centres is uncertain and will require further investigation.

The foregoing analysis is premised on factors such as the population and employment distribution and the continuance of the

1980 per capita expenditure levels; and is subject to review as circumstances change. It is indicative, however, of the floorspace and trading levels supportable at the town centres

Social and Community Facilities

Employment and retail opportunities are only two of the activities provided at centres. Other facilities which cater for the social life of the community and are of immediate importance to suburban households are also located in centres; these include banks, post offices, libraries, health services, laundries, hairdressers, repair services, restaurants, coffee shops, clubs and a range of entertainment. The vast majority of these facilities progressively occupy centres in the new areas as space becomes available. Government services are also provided in a similar manner. The Dispersed Plan, because of its provision of town centres in Tuggeranong and Gungahlin, was considered to make a greater range of opportunities available to residents of those areas and therefore could achieve a more equitable provision of social and community facilities to serve the total Canberra community.

Summary

In the centres evaluation both the Concentrated and Dispersed Plans were assessed to determine the performance in centres in terms of development potential of the vacant land, the traffic capacity of the arterial roads accessing the centre, maintaining an effective urban structure, retail performance and the provision of a wide range of social and community facilities.

The conclusion that was drawn from the evaluation was that the existing centres could accommodate the level of development proposed in the Dispersed Plan. However, Civic was found to be approaching thresholds which would be costly to overcome. It was estimated that, at the three existing centres, between 3 000 and 11 000 spaces would be needed in car parking structures at a cost of \$20-\$70 million (Table 84).

Table 84 Summary of Total Car Parking Requirements in Town Centres (1)

	Concentrated Plan		Dispersed Plan	
	15% Mode Split	30% Mode Split	15% Mode Split	30% Mode Split
Number of Spaces in Structures	28 000	15 500	11 100	3 200
Cost of Structures (\$ millions)	170	100	70	20

(1) Excludes Woden East.

In contrast, the Concentrated Plan was assessed to require between 15 000 and 28 000 car parking spaces in structures at a cost of \$100-\$170 million. Because Woden and Civic were not designed for the levels of employment proposed in the Concentrated Plan, both centres would require major additions to their road networks.

The arterial road system in Civic would require one or both of the arterial by-pass routes envisaged in the 1962 Plan and major improvements to the internal distributor road system. Bus-only lanes would be essential as well as an extension of the bus interchange.

In Woden Town Centre, Hindmarsh Drive would need grade separation from Ainsworth Street to Melrose Drive inclusive.

The Dispersed Plan was considered preferable from the overall viewpoint of the provision of retail floorspace and social and community facilities as residents in both Tuggeranong and Gungahlin

would have better accessibility to these facilities. It would also relieve pressure on Woden Town Centre to expand, and prevent intrusions into Civic Centre's market area. The Dispersed Plan would also enable the continuation of the efficient urban structure already developed in Canberra.

Aims Achievement Evaluation

The level and distribution of benefits and costs differ between the Concentrated and Dispersed Plans. They have different impacts on the achievement of the aims of the plan: image, social and economic need, environment, choice, conservation, movement, flexibility, and implementation. This section reviews the performance of the alternative plan options in relation to these aims.

Image

Each Plan would maintain Canberra's landscape character by limiting development on the hills and ridges, by maintaining and developing the National Capital Open Space System, and through other design elements, such as the limitation of building height in Civic Centre.

The potential impacts of the Plans differ in the implications of their prospective employment distributions on the amenity of the Central Area. The Concentrated Plan, due to its higher employment levels in Parkes/Barton and Civic, would result in greater traffic intrusion into residential streets, greater amounts of land being required for parking, higher traffic volumes and deterioration in air quality in the Central Area. The Dispersed Plan is more likely to be supportive of Canberra's role as the National Capital.

Social and Economic Need

The key metropolitan planning function is to determine the best arrangement of activities and population subject to the constraints facing the Commission. A metropolitan plan works within parameters set by population and labourforce projections, although sensitivity to different growth rates is continually monitored. The plan's primary concern is not with issues such as the widening of Canberra's economic base or the social and economic consequences of unemployment, although these are fundamental considerations related to the future growth of Canberra.

The economic implications of alternative plan forms relate to factors such as the level of investment required to implement the plan and the on-going costs of operating the City, including car parking, roads, operating the public transport system, land servicing, commercial developments and the ability of businesses to remain viable.

Social implications include considerations of the lengths and costs of journeys to work, school, shops, recreation and community facilities, and housing choice and cost.

The transportation testing indicated that the Dispersed Plan would require lower levels of road, car parking and public transport investment. As the settlement pattern was assumed to be the same for both the Concentrated and Dispersed Plans, the land servicing and house construction costs would be similar for both plan options. As there is insufficient time to develop Gungahlin prior to the development of Lanyon (under the population growth parameters of the report), the economic and financial costs of different phasing options were not considered to be relevant to the analysis. In terms of centres development, the costs of developing Tuggeranong and Gungahlin Town Centres would be less than that imposed by the expansion of Civic, Woden and Belconnen envisaged under the Concentrated Plan.

The Concentrated Plan might be expected to confer benefits primarily on:

- developers and lessees of existing centres, who would benefit from the restriction of retailing and commercial opportunities in Tuggeranong and Gungahlin

- developers and lessees of the district centres in Tuggeranong and Gungahlin through the lack of shopping choice and competition in these districts
- property owners in the existing towns, whose land values would be increased by the expansion of Civic Centre and the existing town centres.

One often suggested benefit of the concentration of employment and retailing is the development of a more 'vital' city centre. However, the simple employment expansion of Civic from 16 000 to 35 000 under the Concentrated Plan, would not, by itself, establish a more 'vital' city. This employment expansion would assist Civic retailers by about \$30 million per annum by the 408 000 Canberra-Queanbeyan population level. The 'out of hours' demand for Civic services and facilities is conditioned by the quality and variety of services Civic offers. These are not simply a function of employment. Increased land values in Civic under the Concentrated Plan would place pressures on lower rent activities to relocate, many of which, such as restaurants, clubs and bookstores, give centres the diversity and urbanity many people desire. These activities would have greater opportunities for location in Civic under the Dispersed Plan, as a result of the lower pressure on land values.

Civic is the most central of the town centres to the Canberra-Queanbeyan population of 408 000. As such, it has the capacity to cater for demands that cannot be met by individual town markets. Under both the Concentrated and the Dispersed Plans, Civic is seen as the tourist, cultural and entertainment centre of Canberra.

The Dispersed Plan's advantages include:

- **Higher Self-Containment**

The establishment of town centres in Gungahlin and Tuggeranong would provide greater equality of access to shops, employment, recreation and community facilities across the metropolitan area. Opportunities are also provided to residents of these districts to work, shop and recreate in the towns in which they live. The benefits of the Dispersed Plan are reflected by the degree of self-containment.

During the morning peak, the level of self-containment (the proportion of trips which start and finish in the same town) in Tuggeranong and Gungahlin would improve substantially under the Dispersed Plan. In the Concentrated Plan, the level of self-containment in Tuggeranong is 21 per cent and in Gungahlin 22 per cent. The self-containment rate increases to 41 per cent and 35 per cent respectively under the Dispersed Plan. Higher rates of self-containment reduce the level of road capacity required.

Particularly needy groups, such as the unemployed and those without access to a car, would have better access to facilities in terms of both time and cost under the Dispersed Plan. (The particular needs of sub-groups such as government housing tenants, the aged, and the disabled are considered largely through the siting of their housing, which is more a local planning concern. However, they would all benefit by having better accessibility to town centre facilities).

- **Lower Average Travel Costs**

Under the Concentrated Plan, average trip cost in the morning peak hour is 24 per cent higher than the average existing trip cost, while the Dispersed Plan's average trip cost is 11 per cent higher. Under the Concentrated Plan, Tuggeranong residents' average morning peak-hour trip cost is 76 per cent higher than the current average morning peak cost, and under the Dispersed Plan 40 per cent higher. The relative impact of each plan option by district is shown in Table 85.

Average travel costs in the morning peak hour in Inner Canberra, Woden and Belconnen rise in both plan options as a result of

Table 85 Relative Trip Costs

	Existing (1982)	Concentrated Plan	Dispersed Plan
North Canberra	76	92	81
South Canberra	122	90	84
Woden-Weston Creek	102	115	106
Belconnen	77	140	123
Tuggeranong	135	176	140
Gungahlin	121	140	125
Canberra Average	100	124	111

increased congestion, although this is more pronounced in the Concentrated Plan.

- **More Equitable Distribution of Land Values**
Property owners in Tuggeranong and Gungahlin would receive benefits, in terms of increased land values through their proximity to urban opportunities. There is greater equality of benefit under the Dispersed Plan.

The Concentrated Plan would have major impacts on residential amenity in areas surrounding Civic. A large Civic is more likely to result in higher levels of intrusion by non-residential activities. This intrusion would have the effect of increasing land values, and, through them, property prices and rates. This would work to the detriment of aged owners in meeting their rates and lower income groups, who could not afford to live close to the amenities and employment opportunities that Civic would offer. They would be forced to locate in areas of lower accessibility.

Land values in parts of Woden and Belconnen would similarly rise, but not to the same extent as in the Central Area. The net result of the intrusion of non-residential uses would be a reduction in the population dependent on Civic for shopping and other facilities, contrary to the aim of assisting the development of a ‘vital’ Civic.

A ‘large’ Civic would result in substantial traffic intrusion through residential streets and significant deterioration of the environment. Employment concentration in Civic could result in high parking intrusion in areas such as Reid and Braddon, if the parking structures required were not provided, or if there were resistance to the parking charges imposed.

Environment

Ecological Resources

Because development in Gungahlin and south-eastern Tuggeranong is common to both the Concentrated and Dispersed Plans, there are no major differences between the options, in terms of the impact on ecological resources, open space and recreation areas, or the viability of rural land use. However, the implications of development in both areas will need to be given due consideration during planning, design and construction so as to minimise the impact on soil erosion, drainage systems, sites of ecological significance, recreation resources, rural productivity and management of open space.

These issues are of greatest concern with regard to the impact of peripheral parkways and arterial roads. It is also apparent that the environmental impact of development in south-eastern Tuggeranong will be greater than in Gungahlin largely because of the presence of the Murrumbidgee River and large open space and rural areas surrounding the new town area.

The most significant differences between the Concentrated and Dispersed Plans in environmental terms relate to the impact on the

existing environment of Canberra, particularly with regard to noise and air quality. Noise impacts are discussed later in this section. The Transport Evaluation indicated that the Dispersed Plan would offer advantages over the Concentrated Plan, in reducing the concentrations of air pollutants in certain parts of Canberra. An air quality modelling technique is currently being used to predict future concentrations of carbon monoxide throughout the urban area.

Open Space and Recreational Use

Differences in the two plan options are apparent with regard to the pressure of increased recreational use on local resources. However, this pressure is likely to be inevitable for either Plan, with the location rather than the magnitude of the problem being different in each. There is scope for minimising the impact of increased recreation pressure during the planning process.

The major difference between the plan options relates to the implications for recreational use in the vicinity of major employment areas. In the Concentrated Plan, the intensification of employment in Civic would increase the pressure on recreation resources around the Lake Burley Griffin foreshores. These resources are currently not developed to a sufficient extent to accommodate this increased usage and further intensive recreation facilities (for example, similar to Weston Park) may be needed, perhaps in the Acton Peninsula and Ferry Terminal areas.

The requirement for a third lake crossing in the Concentrated Plan would also have a detrimental effect on the recreational resources of Black Mountain Peninsula, Lake Burley Griffin and parts of Yarralumla.

Noise Impacts

Adverse impacts resulting from both the Concentrated and the Dispersed Plans, include the following:

- Ainslie Avenue - potential problem area as a result of Monash Drive with possible noise impacts in Ainslie, Reid and Braddon
- Limestone Avenue - noise guidelines will be exceeded
- Majura Avenue - noise guidelines will be exceeded
- Northbourne Avenue - noise guidelines will be exceeded at several points
- Lyneham - the impact on this suburb will depend on the eventual location and design of John Dedman Drive/ Arterial. For example, if traffic is allowed to pass through Lyneham, the residential environment will be detrimentally affected
- Hindmarsh Drive - potential problem at several points, particularly between Melrose Drive and Launceston Street
- Deakin/Forrest/Griffith - traffic could create problems within these suburbs.

Adverse impacts peculiar to the Concentrated Plan include:

- Antill Street - existing problem likely to be aggravated
- Wakefield Avenue - potential problem created
- Yarralumla - potential problem created by dramatic change in traffic patterns through this area
- Turner - existing problem aggravated and further potential problems created by third lake crossing encouraging traffic on Barry Drive.

No adverse impacts were identified which were peculiar to the Dispersed Plan.

Improvements resulting from both Plan were considered to be of a minimal nature and did not appear to favour any particular option.

In summary, on a comparative basis, the Concentrated Plan would have a marginally greater impact, notably in the Yarralumla area and in North Canberra along Antill Street, Wakefield Avenue and Barry Drive.

Both plan options would significantly increase traffic noise in the inner city suburbs of Braddon and Reid, particularly along Limestone Avenue. The Concentrated Plan would result in a less satisfactory overall residential noise environment than the Dispersed Plan.

Within the general framework of the plan options presented, it will be necessary to explore more detailed traffic management options which will alleviate the existing and potential traffic noise problems.

Water Resources

An evaluation of the two options was carried out to determine their implications for the augmentation and extension of hydraulic infrastructure, and for water uses.

Hydraulic Infrastructure

Water Supply Management

The population projections indicate that there will be a need to augment water supply headworks during the plan period. It is possible that the next stage may be a further development within the Cotter catchment, rather than the construction of Tennent Reservoir. Given the lower growth rates, the adoption of second class water supply systems becomes more economically attractive.

The major infrastructure components will comprise:

- construction of the Googong Link Main to Tuggeranong
- extension of the Tuggeranong bulk supply system
- construction of the Spence to Hall bulk supply main, and extension of bulk supply into Gungahlin
- extension of the Googong main from Campbell to Hackett and north-east Gungahlin
- construction of Stage 2 of the Googong Water Treatment Plant
- upgrading of the Mount Stromlo Water Treatment Plant.

Wastewater Management

The population projections indicate that there will be a need to augment the capacity of the Lower Molonglo Water Quality Control Centre during the plan period. Experience gained during the commissioning of the plant indicates that the standards adopted in 1971 are appropriate to the protection of downstream waters. The high cost of high-quality treatment can be offset to some extent by utilising economies of scale available with the augmentation of the existing plant. Augmentation also provides an opportunity to incorporate the benefit of advances in wastewater treatment design since the early 1970s.

The Main Outfall Sewer, a tunnel constructed in 1918, has been operating under surcharge conditions for some years. In the interest of safety of the structure, and in view of a portion of Gungahlin falling into the Main Outfall Sewer catchment, augmentation of this structure will be required.

The extension of trunk sewers will be required in Tuggeranong (Lanyon Trunk Sewer) and Gungahlin (Ginninderra Trunk Sewer, Sullivans Creek Trunk Sewer) to service the new urban areas.

Surface Water Management

The development of new urban areas requires the installation of systems for managing runoff from these areas consistent with the protection of life, property and urban amenity. Since the 1970s, there has been a shift to incorporating waterways into the urban environment as an integral part of the open space system, such that the construction of water pollution control ponds must respond to recreational and aesthetic criteria as well as to technical criteria.

The water quality evaluation has indicated the importance of containing urban runoff pollutants in order to protect the water quality and recreational amenity of the Murrumbidgee River and Lake Ginninderra. The construction of Village Creek Weir, the Tuggeranong water feature, and of a water pollution control pond at Point Hut would be required in Tuggeranong to protect the Murrumbidgee River.

Water quality analysis of proposals for Lake Tuggeranong has indicated that the lake water quality will fall short of a standard appropriate to a range of recreational uses. Means of resolving this problem are currently under study.

The construction of the Stranger Creek and Point Hut Creek Main Drains will be required to service new urban areas.

In the case of Gungahlin, it is proposed to retain, as far as is practicable, the natural drainage system as the principal mechanism for containing urban runoff pollutants. The assimilative capacity of these systems will be augmented by the incorporation of a number of wetlands or control ponds into the drainage system. The effectiveness of these systems in containing urban runoff pollutants will be dependent on the extent to which peaks in runoff can be minimised. The retention of natural depressions, the adoption of indirect drainage and the avoidance of development on unsuitable soils are some of the techniques that may be employed to minimise peaks in runoff.

Water Use Implications

The options, incorporating the water supply, wastewater and surface water management assumptions identified earlier, were analysed by means of the Streamflow, Riverwater Quality, River Macrophyte, and Lake Loading Models.

With the construction of Village Creek Weir and the lake in Tuggeranong, the analysis indicated that there will be a significant improvement in the water quality of the Murrumbidgee River downstream of the Tuggeranong Creek confluence. The diversion of Stranger Creek to Tuggeranong Creek will avoid the discharge of urban runoff at Pine Island. An increase in the incidence of macrophytes and occasional bacteriological pollution will occur downstream of Point Hut Creek, although generally water quality will be well within primary contact (swimming) standards.

It is estimated that the drainage provisions in Gungahlin (retention of natural channels, incorporation of wetlands, constraints on urban form) will limit the additional nutrient loading on Lake Ginninderra to 30 per cent, while reducing the hydraulic retention time by 20 per cent. The Lake Loading Model indicated that the net effect of these changes will be a 5 per cent increase in algal levels.

As a result of increased use of Googong Reservoir for water supply purposes, and further urban development (portion of Gungahlin) in the catchment, there will be a marginal increase in algal levels (10 per cent) in Lake Burley Griffin. However, the Lake Loading Model indicated that this increase will be more than offset by the reduced discharge of nutrients in sewage effluent following the upgrading of the Queanbeyan Sewage Treatment Works.

Choice

The Dispersed Plan would provide greater choice within the urban area as it involves establishing town centres in both Tuggeranong and Gungahlin and the employment, retail and community facilities this would entail.

The Dispersed Plan would produce relatively lower pressures on land prices surrounding Civic and the town centres. As such, it would allow greater access to housing near these centres than the Concentrated Plan.

As the settlement sequence was assumed to be the same for the two plan options, the level of choice in new housing areas would be largely the same. In the next few years, there will be some choice between Tuggeranong, Belconnen and Woden-Weston Creek. There will be a period, though, where housing choice for new standard dwellings will be restricted to Tuggeranong. New medium-density dwellings will, however, be available in a number of towns throughout the plan period, either through development of vacant sites or through redevelopment. Redevelopment is likely to be greater under the Concentrated Plan, as a result of the employment distribution.

Conservation

As the settlement pattern is the same for the two plan options, the impacts on the natural and rural areas and river systems would be similar. In relation to the man-made environment the higher employment levels in Civic are likely to result in greater urban change pressures in Inner Canberra. As a result, the Concentrated Plan would pose a greater threat to the conservation of Canberra's heritage.

Flexibility

A metropolitan plan requires the capacity to be able to respond to different rates of growth, and other changes in the social, political and economic environments. In Canberra, the level of growth has varied from about 11 000 per annum in the early to mid 1970s to 3 300 per annum in 1980-81. A drop in the rates of population increase affects the demand for land, housing, education facilities and retail floorspace. As Canberra's economy is likely to continue to be dominated by the government sector, it will continue to be susceptible to changes in government policy.

Possible changes which might influence the implementation of the metropolitan plan include:

- variations in rates of growth
- limited funding
- increased energy prices
- ACT self-government.

Variations in Rates of Growth

Slower rates of growth extend the time period over which a plan is implemented. The longer the plan period, the more likely are deviations from the assumptions underlying the plan.

The level of growth influences the timing of employment dispersal and the decision as to whether Lanyon or Gungahlin should follow the development of North-East Tuggeranong. If Canberra grows at the rate of natural increase, the 1991 population would be 257 500, the workforce about 117 200 and the number of Public Service Act (PSA) office users 35 900. Settlement in North-East Tuggeranong (including the Town Spine) would not be completed until about 1995.

In this scenario, the establishment of an office employment centre in Tuggeranong would be delayed until after 1991. Between 1983 and

1991, PSA office employment would grow by only 3 300, all of which would occur at existing centres. Between 1991 and 2001, PSA office employment would grow by 3 600, allowing some discretion to establish an office centre in Tuggeranong.

Under conditions of slower growth, the development of Gungahlin could proceed before development of Lanyon. Under the Concentrated Plan, this would result in transport advantages to Gungahlin as it is more accessible than Lanyon to the proposed employment centres. The development of Gungahlin prior to Lanyon would, however, require the earlier committal of investment.

A slower growth rate would not preclude the development of town centres in Tuggeranong and Gungahlin. A Tuggeranong population of 89 000 would be able to support retail floorspace in the order of 50 000m² at the town centre, and the level of employment distributed to the centres could be as great, though over a longer time period.

Regardless of the rates of growth, the transport and social consequences of alternative land use distributions would still be felt.

Limited Funding from Government

The metropolitan plan requires substantial investment by the public and private sectors for its implementation. The Dispersed Plan requires lower levels of infrastructure investment by the Commonwealth Government and assists in reducing its operational costs. As the total amount of office, retail, housing, industrial and residential land development is assumed to be the same for the two plan options, the level of investment by the private sector required is likely to be similar for both the Concentrated and Dispersed Plans. A possible exception may be in the development of office space. If the government decides that the private sector should construct offices, the private sector would prefer to build at existing centres, particularly Civic, as they are proven investment locations. For the private sector to construct offices for government tenancy in Tuggeranong and Gungahlin, assurances concerning occupancy may need to be given. They would be assisted by the likely lower costs of office sites in the new towns.

Adoption of the Concentrated Plan could result in major phasing difficulties in periods of government expenditure restraint. Failure to provide the road and car parking capacity required would result in increased lengths and costs of journeys to work, higher energy usage, air pollution, and increased parking intrusion in residential streets, particularly near Civic.

Increased Energy Costs

The Dispersed Plan is likely to be able to cope better with increases in energy costs than the Concentrated Plan. This is because the establishment of town centres in Tuggeranong and Gungahlin would provide opportunities for the residents of these districts to have shorter journeys to work, comparison shopping and community facilities. Higher levels of self-containment result in shorter distances for the movement of people and goods.

The Dispersed Plan would allow the efficient servicing of these nodes by public transport, thereby minimising some of the costs associated with the suburbanisation of employment in other cities.

ACT Self-Government

The nature and form of self-government for the ACT is yet to be determined. No matter what the nature of self-government, the economic, social and transport impacts of the Concentrated and Dispersed Plans would remain. Whether self-government would result in a greater or lesser likelihood of implementing a plan cannot be

known, as it would depend on the value and opinion of the representatives elected and the financial arrangement under which self-government occurs.

Implementation

Employment

The implementation of the Dispersed Plan is likely to rely on the ability of the Commission to disperse Public Service Act (PSA) office employment to the new towns, and the overall growth in PSA office employment. It is considered that the opportunities to direct other government employment to the new towns will be limited, and that the private sector employment attracted will be related to serving the needs of the town populations. If opportunities to disperse employment in these other employment sectors do arise, however, the ability to implement the Dispersed Plan will increase.

The establishment of the Woden and Belconnen Town Centres relied on the dispersal of PSA office employment. At March 1983, PSA office employment at these centres totalled 9 700, about 30 per cent of the total PSA office employment in the ACT. Between 1968 (when the first offices at the Woden Town Centre were occupied) and 1983, the number of PSA office users increased from 15 000 to 32 600. Woden and Belconnen Town Centres were able to attract 55 per cent of this growth.

Within the plan period, PSA office employment is likely to increase by 20 300. If the Tuggeranong and Gungahlin Town Centres attained a 55 per cent share of growth, as did Woden and Belconnen Town Centres between 1968 and 1983, PSA office employment in these centres would be 11 200 (Table 86).

Table 86 Growth in Public Service Act Employment 1968-2003

		PSA Employment	PSA Office Users
June	1968	17 700	15 000
March	1983	38 800	32 600
June	1986	40 800	34 700
June	1991	47 900	40 700
June	2001	59 900	50 900
June	2003	62 200	52 900

At June 1981, approximately 50 per cent of employment at the Woden Town Centre, and 60 per cent of employment at the Belconnen Town Centre, was comprised of PSA office users. Applying the Woden relationship of PSA office employment to other employment (as Woden represents a more mature town centre structure), employment at the Tuggeranong and Gungahlin Town Centres would be 22 400.

To achieve the employment levels for Tuggeranong and Gungahlin Town Centres in the Dispersed Plan, 13 000 PSA jobs or 64 per cent of PSA office expansion in the plan period, would need to be dispersed. This appears optimistic, having regard to what has been achieved at the Woden and Belconnen Town Centres, and the nature of office growth. The office growth that eventuates is likely to occur through the expansion of existing departments rather than through the creation of new departments. Office expansion in the Woden and Belconnen Town Centres has been assisted by each centre being identified for functional groupings of departments, e.g. social welfare departments at Woden and technical departments at Belconnen. If the departments at Woden and Belconnen grew at the average rate

of expansion of the Public Service in the plan period, their office employment would expand by 6 100. An overspill from these centres would clearly not achieve the dispersal necessary.

A factor contributing to the demand for new office buildings is space per worker. Between 1969 and March 1983 rentable floorspace per PSA office user increased from 11.7m² to 16.7m². This trend towards increasing space per worker may assist the dispersal of employment.

The Dispersed Plan assumes that government employment can be further dispersed in Canberra without detriment to the administrative efficiency of the Public Service. Further consultation will need to be undertaken in this regard. It is conceivable that the internal efficiency of departments could be improved under the Dispersed Plan, if the establishment of new town centres enabled an entire department to be sited at the one complex. Dispersal could possibly reduce the external efficiency of departments. However, the increasing development of communications technology, reducing the need for face to face contact, may counteract possible disadvantages of dispersal. It should be remembered that the travelling times to the Tuggeranong and Gungahlin Town Centres from the Central Area will be in the order of 15-20 minutes. They will be approximately 40 minutes travel time from each other, however. The departments located in Tuggeranong and Gungahlin Town Centres could be based on a degree of contact with the departments located at the adjacent town centre, in which case, the travelling time would be in the order of 10 minutes.

For the private sector, both plan options offer the opportunity for substantial investments in retail, office and other facilities. Civic is currently the preferred location for private enterprise office investment. The construction of offices in Tuggeranong and Gungahlin could be undertaken either by the private or government sector. The private sector would require an occupancy guarantee, if it was to undertake construction of offices in these locations.

The timing of the dispersal of employment is also important, as it affects the degree of self-containment. Tuggeranong's development will be substantially complete by 1990. It is desirable that employment opportunities be available within Tuggeranong by this time, on both transport and social equity grounds. It is apparent there is little scope for office employment dispersal before 1986, given the commitments in Civic, and the level of growth forecast. For many of the benefits of the Dispersed Plan to be achieved, major office dispersal to Tuggeranong needs to take place between 1986 and 1991. Similarly, in Gungahlin, the better the co-ordination between population and employment, the greater the level of self-containment is likely to be.

The Concentrated Plan may be easier to implement. The existing nodes meet the current locational preference for the Department of Administrative Services, the various government departments and the private sector. Agreement to expansion within these nodes would not be difficult to achieve. Civic would grow through it being the location of most of the private sector office construction; Russell/Campbell Park through defence department expansion; Parkes/Barton through expansion of the key policy departments; and Belconnen and Woden through the growth of departments at those nodes. Despite its possible ease of implementation in the short term, a disadvantage of the Concentrated Plan is the higher level of investment required for its implementation.

Having regard to the advantages offered by the Dispersed Plan, the Commission intends to advocate strongly to government and private sector decision makers that the overall well-being of the City outweighs any perceived administrative inconvenience in its adoption.

Public and Political Acceptance

Parts of the private sector may be more inclined to support the Concentrated Plan on the grounds that it:

- proposes major employment expansion in Civic Centre which would increase land values in the centre, the main location of private office investment in Canberra
- proposes expansion of retailing and employment in the Woden and Belconnen Town Centres, which would similarly provide benefits to existing developers and lessees.

Residents of Tuggeranong and Gungahlin will probably support the Dispersed Plan as the establishment of town centres in these districts would provide them with improved accessibility to work, shops and other opportunities, and would enhance their housing investment.

Political acceptance of the Dispersed Plan would be assisted by the lower levels of government investment necessary.

Summary

On the basis of the aims set for the metropolitan plan, the Dispersed Plan is preferable to the Concentrated Plan. It would better protect the image of Canberra by its lower level of employment and traffic impact in the Central Area; it requires lower levels of investment in roads, car parking and public transport; lower levels of employment at Civic Centre, Woden Town Centre and Belconnen Town Centre would result in better air quality; and greater choice is available through the establishment of town centres in Tuggeranong and Gungahlin. The Dispersed Plan, by encouraging higher levels of self-containment would reduce the levels of movement within the metropolitan area. The Plan implies a more equal distribution of opportunities over the metropolitan area; would result in a more equitable distribution of land values; and would better protect the residential amenity of Inner Canberra residents by lowering urban change pressures and the extent of traffic and parking intrusion.

The advantages of the Dispersed Plan, in relation to flexibility and implementation, are not as clear cut. The Dispersed Plan better reflects the plan form that is emerging in major cities, where regional centres are being established. This form is likely to be better able to cater for possible energy shortages, as it places employment opportunities closer to home, and at centres capable of being efficiently served by public transport. In the eventuality of lower growth, there is likely to be pressures to consolidate development at existing centres, although the costs to the residents of Tuggeranong and Gungahlin and to the Commonwealth, would rise with greater imbalance between settlement and employment expansion. In terms of plan implementation, the Dispersed Plan requires greater co-operation of the private sector, the Department of Administrative Services and other government departments, as the Concentrated Plan better meets their current locational preferences. These important decision makers need to be convinced of the merits of the Dispersed Plan, not just in the lower investment levels required by the Commonwealth, but also in the opportunities it provides to both the private sector and government administration.

The plan forms are not neutral in their impact. The Concentrated Plan would impose higher transport and social costs, particularly on the residents of Tuggeranong and Gungahlin and would require higher levels of government investment in terms of roads, car parking and public transport. It is more restrictive on the housing choice of people on low incomes, as a result of its impact on land values

The Commission believes that the Dispersed Plan better meets the aims set for the Metropolitan Plan, being more efficient in transportation terms and providing greater equality of access across the metropolitan area.

The Preferred Plan

The testing of the Concentrated and Dispersed Plans assumed that the minimum size of the Erindale Centre would be as outlined in the *Erindale Centre Development Plan* (November 1982)

Consequently, Erindale was tested at 14 000m² under the Dispersed Plan. Since the testing was undertaken the Commission has reviewed its planning for Tuggeranong and it is now considered that 4 000m² of retail floorspace is the appropriate size for the centre. The reasons for the change in size of the centre are as follows:

- the *Erindale Centre Development Plan* assumed the development of Tuggeranong would cease at 60 000 population, at which time the development front would move to Gungahlin. The development of Tuggeranong is now to proceed to a population of approximately 90 000
- as a consequence of the additional population, the demand for retail and community facilities and the need for employment in Tuggeranong will be greater. This will require the earlier provision of Tuggeranong Town Centre
- the Canberra Commercial Development Authority (CCDA), which had been given the responsibility of developing the Erindale Centre to 14 000m² of retail floorspace, proposed that the centre be expanded to 24 000m². A centre of this increased size would result in major traffic intrusion on residential streets surrounding the centre
- the Erindale site is of insufficient area to cater for the community, office and other uses generated by a Tuggeranong of 90 000 population. The Tuggeranong Town Centre site has the necessary capacity and is better located to serve the future population of 90 000, with Drakeford, Athllon, Isabella and Erindale Drives focusing on the site
- the co-location of offices, retailing and other uses on the one site has several major advantages including easier servicing by public transport, shared use of facilities such as car parking, and the creation of a focus for the town. In addition, several activities mutually support one another e.g. office workers support retail stores
- the restriction of Erindale to 4 000m² of retail floorspace would increase the viability of a retail release at the Tuggeranong Town Centre and allow major comparison retailing opportunities to be consolidated at the centre

The proposed reduction of the size of Erindale has minimal impact on the results of the testing described earlier in this Chapter. The key element in the transport testing was the distribution of employment. The reduction in Erindale's retail component to 4 000m² will mean that the level of complementary uses located at the centre will also be reduced. In total, the employment at the centre could be reduced to about 700 which is approximately 1 000 less than assumed in the testing. This is not substantial in terms of trip generation on the metropolitan road network. As such, no re-testing was considered necessary as a result of the changed size of the Erindale Centre.

The testing of the Concentrated and Dispersed Plans confirmed that large volume vehicular traffic should continue to be carried on a peripheral parkway system. However, the analysis carried out in this and other studies has revealed a need to provide better accessibility from the parkway system to the Central Area. Consequently, the proposed alignment of Monash Drive Eastern Parkway has been modified from the alignment assumed in the testing, to pass closer to the Central Area without compromising its ability to carry by-passing traffic.

Direct connection to the Central Area is considered vital to avoid overloading of Northbourne Avenue with traffic from Gungahlin and the consequent degradation of residential amenity in North Canberra which would occur as ‘rat-runs’ developed through the suburbs. By making the new road system more attractive than the existing North Canberra network, these problems can be avoided, and the potential for improved public transport operations on Northbourne Avenue can be retained.

The evaluation of the Concentrated and Dispersed Plans clearly shows the benefits of decentralising employment opportunities and retail floorspace, although the ability of the Commission to obtain the benefits of the Dispersed Plan will depend on the co-operation of government authorities, the private sector and community groups.

Given the constraints outlined earlier in regard to implementation, it may be difficult to fully achieve the Dispersed Plan. In view of the complexity in establishing employment in new centres, precise employment figures cannot be specified. Having regard to the level of employment dispersal the Commission was able to achieve between 1968 and 1983 at the Woden and Belconnen Town Centres, the nature of office growth and other activities which have been located at town centres, the most likely range of employment located at major nodes at the end of the plan period could be as shown in Table 87.

Table 87 Planned Employment Levels at Major Nodes

Civic Centre	25 000 - 27 000
Parkes/Barton	15 000 - 18 000
Woden Town Centre	11 000 - 13 000
Belconnen Town Centre	13 000 - 15 000
Tuggeranong Town Centre	12 000 - 17 000
Gungahlin Town Centre	7 000 - 12 000

This range of employment is based on the Dispersed Plan but also assumes a lower level of decentralisation which has been broadly assessed as workable even though less efficient.

The Commission will endeavour to achieve a high level of employment dispersal to the new towns, in order to improve the functioning of the City, to reduce traffic congestion and to ensure that all residents are within a reasonable distance of an appropriate range of facilities. Generally, the greater amount of dispersal achieved, particularly to Tuggeranong Town Centre, the greater the potential benefits will be in relation to avoiding congestion, long journeys to work and adverse environmental effects.

Introduction

Policy Plans comprise statements of planning objectives and policies. The purpose of a Policy Plan is to focus attention on the Commission’s intention to initiate, encourage or control land use changes in an area.

The Metropolitan Policy Plan describes the Commission’s adopted land settlement strategy and relevant town planning objectives and policies for the whole of Metropolitan Canberra. It describes how the Commission envisages the long-term future development of Canberra. Detailed proposals, with particular emphasis on the planning and design of public facilities, are shown on local Policy Plans prepared as required, and either published or made available for inspection at the NCDC offices.

The policies of the Plan are described in two parts. The first relates to the policy intent with respect to the urban structure of the City, and the second to those subjects of the Plan which require more detailed explanation.

Principles of Urban Structure

On the basis of the evaluation carried out and after consideration of the public submissions on the 1980 *Metropolitan Issues - Public Discussion Paper*, the Commission's preferred metropolitan strategy is that which retains the basic principles and structure of the Y-Plan, with adjustments to the implementation strategy in order to enable the principal components of the Plan - the towns, town centres and transport system - to function more effectively.

The Metropolitan Policy Plan describes the Commission's town planning policies which will guide the future development of Metropolitan Canberra. In order to meet future land use demands and obtain a coherent urban structure, Canberra has been classified into several land use categories, as indicated on the Policy Plan (Figures 63 and 64). Essentially, they are preferred dominant land use activity areas. The main policies to guide the future urban structure of Canberra are as follows.

- **The Central Area**

This is the heart of the National Capital, within which are located the Parliamentary Zone, Civic Centre and the government office areas of Barton and Russell Campbell Park. It contains the most significant concentration of employment in Metropolitan Canberra.

The Commission will continue to develop the Central Area to accommodate functions related to Canberra's role as the National Capital and Seat of Government. Special regard will be given to the quality of the overall environment and to transport and traffic management.

The Parliamentary Zone is the national centre of the activities of Parliament, the Judiciary and Government, and is the focal point of visitor interest in the National Capital. The Parliamentary Zone accommodates significant national institutions and the key policy-making departments. The intention is that the Zone should be used for Parliament House and its ancillary activities, for buildings to accommodate functions specifically related to Parliament and the executive branch of government, and for important national institutions.

Civic Centre is Canberra's principal administrative, financial and commercial centre. It is intended that Civic will continue to be developed as the Central Business District and administrative centre of Metropolitan Canberra and will be encouraged to provide for further specialisation of business, retailing and community services.

- **Town Centres**

The existing town centres at Woden and Belconnen provide community focal points for residents of their respective districts and offer a wide range of employment, shopping, educational and social opportunities. The previous hierarchy of town centres will be maintained so that Tuggeranong and Gungahlin will each have its own town centre containing high order retail, commercial and office development. The future scale of provision of these facilities will be related to the needs of the respective town catchments and the planned metropolitan employment and retail system.

- **Urban Areas**

Urban areas have developed on a basis of discrete districts or towns. An important planning objective is that each town should be relatively self-contained in order to meet the needs of its inhabitants in relation to employment, retail, service trades, leisure, recreation and community facilities. Each urban district is generally separated from the others by non-urban buffer zones of a predominantly natural or rural landscape.

Future urban areas will continue to be developed in accordance with this established pattern. Each residential community will consist of about 4 000-5 000 people. This corresponds approximately to the threshold needed to support a local school, shops and other local community facilities.

Gungahlin, the next urban district to be developed will be planned on the basis of this established pattern of development.

- **National Capital Open Space System**

Selected areas of open space which are deemed to be of national capital or regional significance will be designated as part of a National Capital Open Space System. To this end, the hills and ridges within and around the urban areas of Canberra are to be kept free of urban development, both to act as a backdrop and setting for the City and also to provide a means of separating and defining the towns. Canberra's lakes, foreshores and river corridors constitute a diverse ecological, scenic and recreation resource which also justifies preservation and reinforcement. These areas, together with the mountain and forest areas west of the Murrumbidgee River and other major open spaces, will comprise the National Capital Open Space System.

It is proposed that the National Capital Open Space System will be progressively built up as an entity which is comprehensively planned, developed and administered. Its purpose is to meet the growing needs of Canberra residents and tourists for recreational and educational open space and to reinforce and enhance the setting of the National Capital. The ultimate boundaries of the system will only be established as local plans are progressively finalised for the various separate parts of the system.

Preferred uses within the National Capital Open Space System are uses associated with recreation, conservation and open space. Other uses which may be located within the system include forestry, agriculture, administrative and utility services, and special developments associated with recreation and tourism. Community facilities and minor retail uses may also be permitted where these uses assist the functioning of recreation and tourism in the area.

The National Capital Open Space System also includes nature reserves which are areas relatively undisturbed by man and possessing ecological and scenic value. They are managed with the aim of maintaining and improving their existing quality and restricting access and development to the minimum needed for educational and scientific purposes and public appreciation. The intention is to protect such reserves as natural resource areas for the existing and future population of the National Capital and its visitors.

- **Major Roads**

Large volume vehicular traffic between the towns will continue to be carried on a peripheral parkway system. Movements between adjacent towns, and between towns and the parkway system, will be carried on the internal arterial road systems.

The intention is to extend and improve the metropolitan road system, commensurate with the needs of the growing city. The location of future roads shown on the Policy Plan will be subject to future detailed engineering and environmental investigation in order to determine their eventual alignment.

- **Inter-Town Public Transport Route**

Public transport movements will be given priority right-of-way on an internal spine system linking the town centres.

To this end, the Commission in conjunction with the Department of Territories and Local Government will continue to investigate routes for express inter-town buses, with a view to eventual reservation of inter-town public transport routes. These routes will provide access from each of the existing and proposed town centres to the Central Area.

- Industrial Areas**
 Industrial areas catering for manufacturing, processing, storage, regional service trades and public utilities are located at Fyshwick, Mitchell and Hume. A special industrial area is located at Harman for industries requiring a degree of isolation. Land has also been set aside at Bruce to establish a high quality, landscaped industrial park for technological and science-based industries. This project is referred to by the Canberra Development Board as the Canberra Technology Park.

 Another area at West Belconnen has been identified for longer-term industrial needs.

 Industrial estates will continue to be located on the edge of urban areas with direct access to the metropolitan arterial road network, and in selected instances to railway and airport networks.
- Special Use Areas**
 These areas are used for national capital and metropolitan functions and may also form part of the buffer zone between the towns. Such functions include scientific and defence establishments, racecourses, the National Exhibition Centre, the Australian National University and the Canberra College of Advanced Education. The principal special use areas are located at Bruce, which already contains the National Sports Centre, Calvary Hospital and the Bruce TAFE College; and at West Deakin, which contains the Royal Australian Mint, several national association headquarters and secretariat buildings, and the John James Hospital and Medical Centre, all located in a predominantly landscaped setting. The intention is to maintain these current special use areas and to provide others to meet the needs of the future growth of the City.
- Airport/Railway Uses**
 The Airport and Railway Station are major metropolitan traffic nodes, being principal arrival points for many visitors to the National Capital. In addition, they are significant nodes for Canberra's metropolitan population seeking interstate travel links. The intention is to upgrade their facilities progressively, in accordance with future growth needs, ensuring that they are appropriate to Canberra's role as the National Capital.
- Rural and Non-Urban Areas**
 These include lands used for rural and broad-acre institutional uses. The rural and non-urban areas form part of the buffer zone between the towns and a land bank for future land use and activity needs associated with the growth of the National Capital. Rural uses comprise grazing, agriculture and forestry. Broad-acre institutional uses include education, scientific and research establishments, defence and communications establishments and metropolitan public utilities. It is intended that rural lands will continue to be used for rural activities, unless required for other land use purposes associated with the growth of the National Capital. Broad-acre institutional uses will be grouped together in selected locations, in order to maintain the essential setting of the National Capital and to provide an economic provision of services.
- Water Catchment Areas**
 The primary purpose of water catchment areas is the efficient harvesting and storage of rain to provide a reliable supply of water which can be utilised with minimum treatment to provide safe drinking water. Canberra's water supply is currently drawn from catchments on the Cotter and Queanbeyan Rivers. The intention is to protect existing catchment areas. To ensure that Canberra's water supply can support future population growth, an additional catchment area on the Naas-Gudgenby Rivers will be reserved.

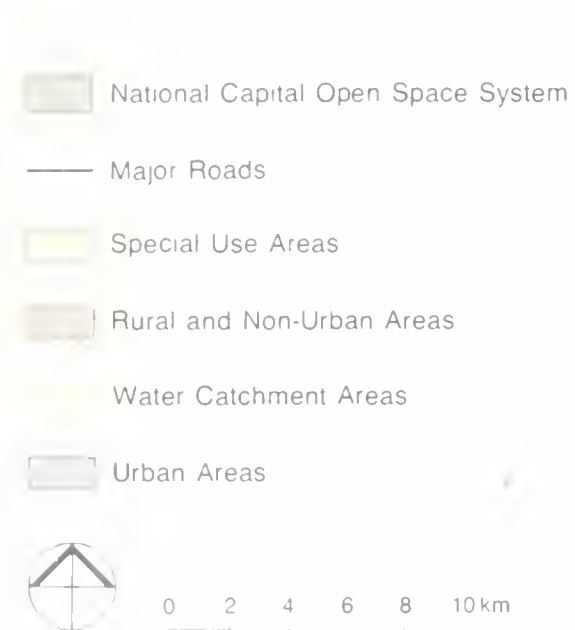
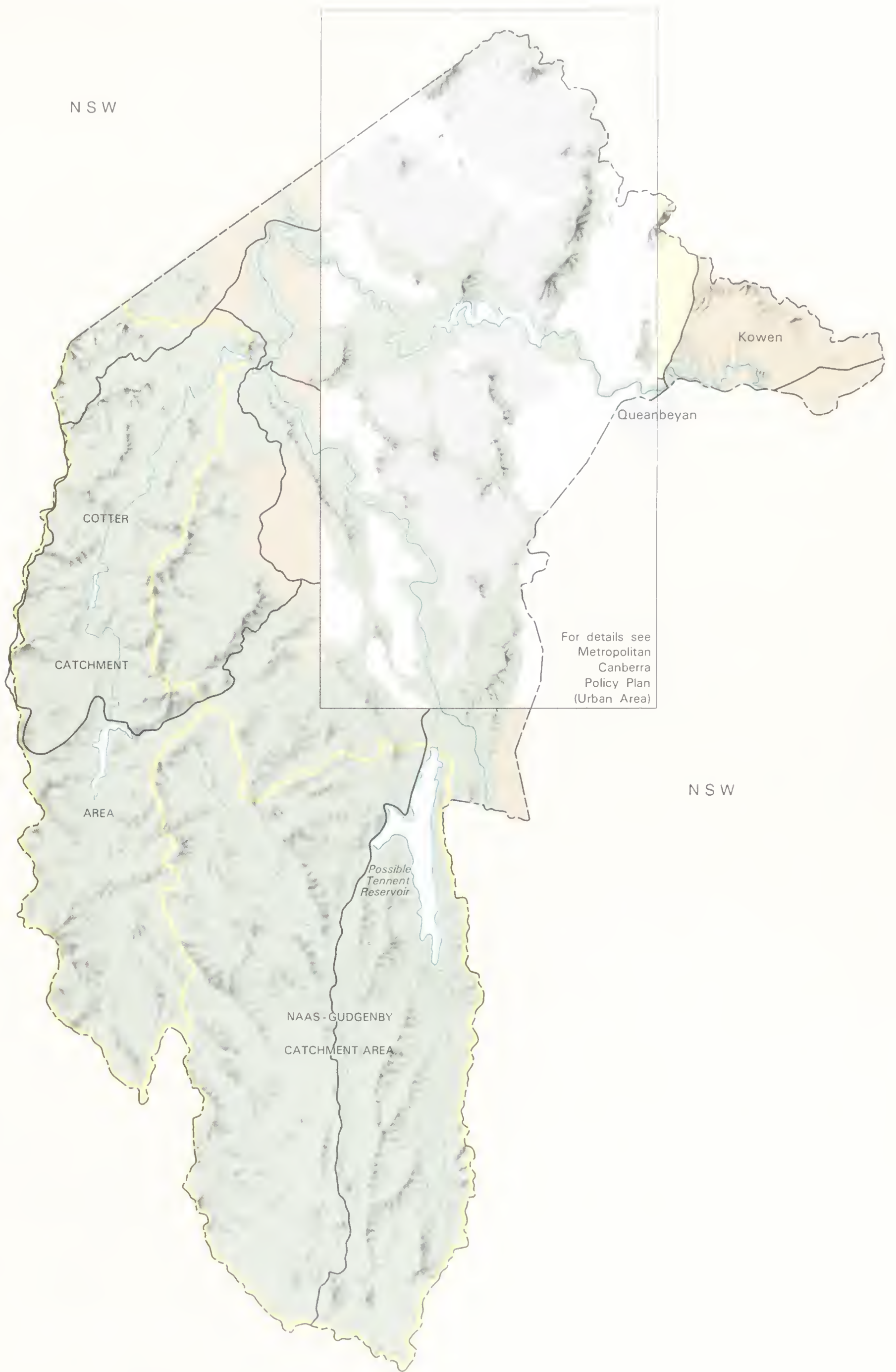


Figure 63 Metropolitan Canberra Policy Plan (ACT)



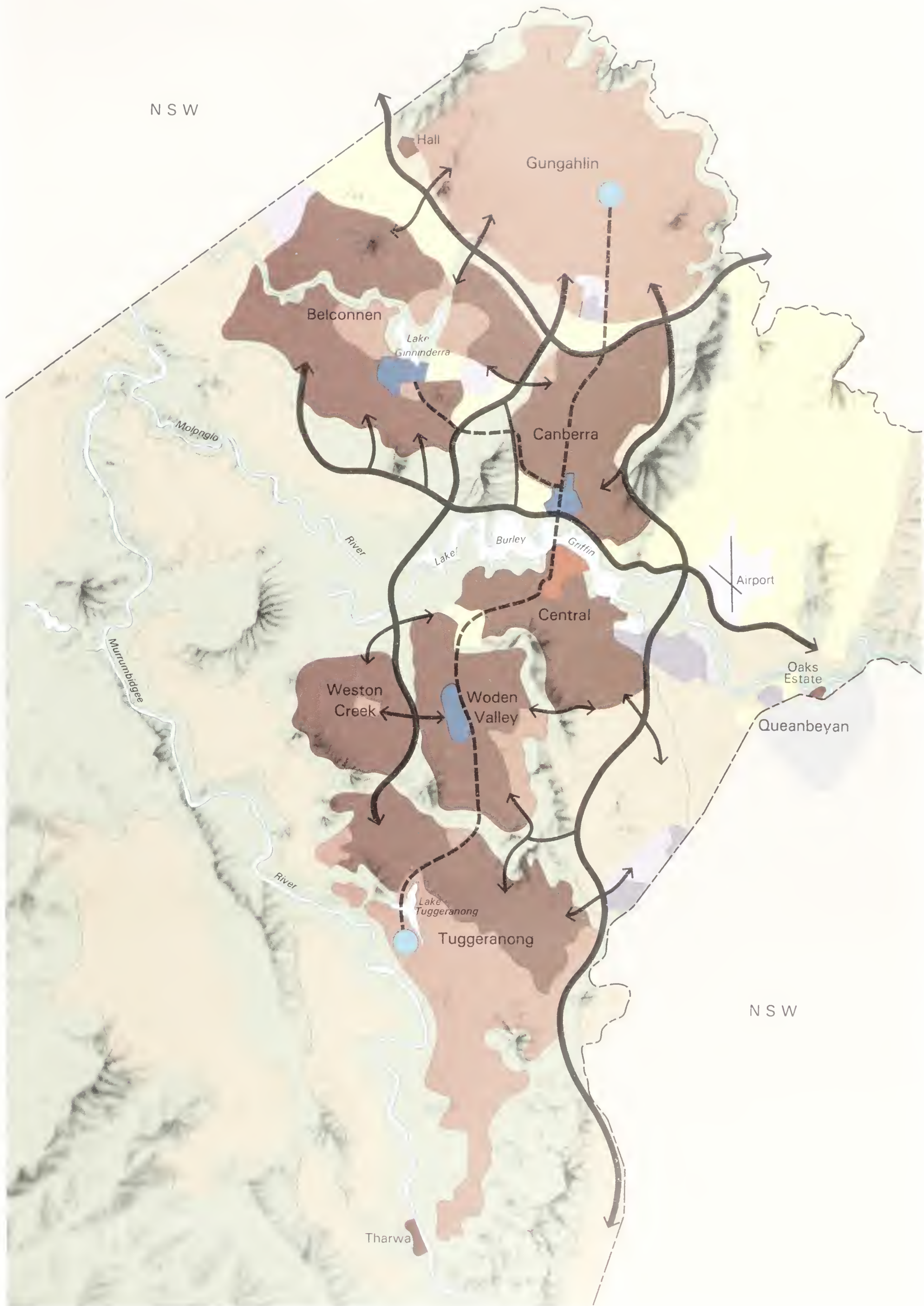
Principles of Urban Structure

The principal concepts of the Y-Plan which have been confirmed as those to guide metropolitan growth and development are as follows:

- The role of the City as the National Capital remains paramount. The National Capital role demands that national functions are located in a prominent position where they may operate effectively and efficiently. The National Capital role also demands that high environmental and aesthetic standards are applied, particularly in the Areas of Special National Concern.
- The metropolitan growth of Canberra is based on the development of separate urban districts or towns, in a linear arrangement in the form of a 'Y'. Each town is intended to be relatively self-contained and provide for most of the needs of its residents including employment, retail, community facilities, leisure and recreation. Each town is separated from adjacent towns by hills, ridges and other major open spaces.
- The hierarchy of centres will be maintained, with each town having a centre acting as a focal point for higher order retail functions, commercial services, offices and community facilities. Civic Centre is intended to be the highest order commercial, entertainment and tourist centre in Canberra. It will also accommodate the majority of specialised functions and continue to develop as the Central Business District and administrative centre of Metropolitan Canberra.
- Large volume vehicular traffic is carried on a peripheral parkway system, reducing the amount of traffic on the internal systems of the towns. A public transport right-of-way will be developed linking the town centres on an internal spine.
- Industrial estates will continue to be located on the edge of the urban areas in locations which conveniently serve the workforce of the towns and have good accessibility for long-distance freight movements.
- The hills and ridges within and around the urban areas of Canberra will be kept largely free of urban development both to act as a backdrop and setting for the City and also to provide a means of separating and defining the towns. Special use areas and rural and non-urban areas also form part of the buffer zone between the towns and a land bank for future land use and activity needs associated with the growth of the National Capital.



Figure 64 Metropolitan Canberra Policy Plan (Urban Area)



Subjects of the Plan

Introduction

This section deals with the key functional elements of the Plan which are regarded as crucial to its successful implementation and which, therefore, require more detailed explanation. The subjects covered are:

- National Works
- Employment
- Offices
- Industry
- Population, Land and Housing
- Retail
- Transport
- National Capital Open Space System
- Recreation and Tourism
- Community Facilities
- Urban Environment
- Rural and Non-Urban Areas
- Public Utilities

National Works

Background and Intent

The functional basis of Canberra is as the national legislative, judicial, administrative, executive, ceremonial and symbolic centre of the Nation. Standards of urban development will therefore be high, befitting the National Capital function.

The National Capital role not only demands high environmental and aesthetic standards, but also requires that national functions are located where they may operate effectively and efficiently.

The need to preserve and develop the spatial structure of Canberra conceived by Walter Burley Griffin led to the definition of the 'Areas of Special National Concern'. They comprise the Parliamentary Zone, the Main Avenues and City Approach Routes, Lake Burley Griffin and its foreshores, the prominent hills and the ancillary national areas. All buildings, roads and landscape improvements within those areas are given special attention and consideration in accordance with the Commission's *Design and Siting Policies* 1973.

Policy

National Capital Uses

In order to provide a strong physical structure to symbolise the role of Canberra as the National Capital, major national uses with strong relationships to Parliament will continue to be located in or adjacent to the Parliamentary Zone while other National Capital uses will be allocated other suitable prestigious locations.

The Parliamentary Zone

Preferred uses in the Parliamentary Zone are those that arise from its role as the physical manifestation of Australian democratic government and as the home of the Nation's most important cultural and judicial institutions and symbols.

The intention is that the Zone should be used for Parliament House and uses directly associated with Parliament. The highest standards of architecture will apply to buildings in the Parliamentary Zone.

Diplomatic Missions

The Commission will identify sites in planned diplomatic areas for all foreign governments seeking representation in Canberra. Diplomatic areas will be established in places which are topographically suitable, have a prestigious location, have good access to Parliament House and other designated diplomatic precincts, and are appropriate in relation to security considerations. Diplomatic areas will be planned and designed in order to facilitate the development and maintenance of a high quality character and setting.

National Associations

National associations will be encouraged to locate in Canberra, through the supply of sites in desirable locations and appropriate development conditions. Inner Canberra will continue to be the preferred location for national associations.

Employment

Background and Intent

Employment, as a measure of economic growth and change, is a key factor in the future development of Canberra. The forecast of employment growth is a prime determinant of the projected future increase in population and, thus, of projected needs for housing and other activities. The future distribution of employment, together with the transport networks, will largely determine how well the metropolitan system operates. The distribution of employment in accordance with the policies and development proposals of the Plan is therefore considered essential.

The policy for employment is intended to assist in protecting the character of the Central Area from transport pressures that might otherwise overwhelm it. The policy also intends that each town should be relatively self-contained.

Policy

The Central Area is, and will remain, the dominant metropolitan employment location. However, the existing policy of decentralising employment opportunities will be continued, in order to ensure that the Central Area can be effectively serviced by transport facilities; to ensure it remains readily accessible from each of the main settlement areas; and to avoid adverse environmental impacts.

Tables 88-93 show the intended distribution of employment opportunities throughout the metropolitan area for the plan period, based on transport and environmental considerations. They indicate the levels beyond which imbalances could lead to serious traffic congestion, car parking problems, increased transport costs and undesirable environmental impacts.

A range of employment is given for the major nodes. As the level of employment available to distribute during the plan period to the Central Area and town centres is about 53 500, it follows that all nodes cannot grow to the maximum levels shown. Generally, the greater the amount of dispersal achieved, particularly to Tuggeranong Town Centre, the greater the potential benefits will be in relation to avoiding congestion, long journeys to work and adverse environmental effects.

Table 88 Summary of Distribution of Employment in the Plan Period

Location	Employment Opportunities		
	Existing (1982)	New	Total
Central Area	44 850	19 450 – 24 450	64 300 – 69 300
Town Centres	17 300	25 700 – 39 700	43 000 – 57 000
Secondary Zones	10 970	9 330	20 300
Local Zones	31 100	9 600	40 700
Total Employment	104 220	64 080 – 83 080	168 300 – 187 300 (1)

(1) It is estimated that total employment will be approximately 177 600.

Table 89 Intended Distribution of Employment in the Central Area in the Plan Period

Location	Employment Opportunities		
	Existing (1982)	New	Total
ANU/CSIRO/ Hospital	7 300	800	8 100
Civic Centre	16 000	9 000 – 11 000	25 000 – 27 000
Parkes/Barton	10 650	4 350 – 7 350	15 000 – 18 000
Russell/ Campbell Park	6 600	4 300	10 900
Other	4 300	1 000	5 300
Total	44 850	19 450 – 24 450	64 300 – 69 300 (1)

(1) The restriction of the Central Area's employment to the lower end of the range would better achieve the benefits of the Dispersed Plan.

Table 90 Intended Distribution of Employment in Town Centres in the Plan Period

Location	Employment Opportunities		
	Existing (1982)	New	Total
Belconnen Town Centre	8 000	5 000 – 7 000	13 000 – 15 000
Gungahlin Town Centre	-	7 000 – 12 000	7 000 – 12 000
Tuggeranong Town Centre	-	12 000 – 17 000	12 000 – 17 000
Woden Town Centre	9 300	1 700 – 3 700	11 000 – 13 000
Total	17 300	25 700 – 39 700	43 000 – 57 000 (1)

(1) It is estimated that total employment at town centres will be approximately 51 300.

Table 91 Intended Distribution of Employment in Secondary Zones in the Plan Period

Location	Employment Opportunities		
	Existing (1982)	New	Total
Bruce	1 700	1 300	3 000
Fyshwick	8 300	700	9 000
Hume	230	3 770	4 000
Mitchell	740	3 560	4 300
Total	10 970	9 330	20 300

Table 92 Intended Distribution of Employment in Local Zones in the Plan Period

Location	Employment Opportunities		
	Existing (1982)	New	Total
Belconnen	5 500	400	5 900
Gungahlin	-	4 600	4 600
Inner Canberra	14 500	300	14 800
Tuggeranong (1)	2 700	3 500	6 200
Woden-Weston Creek	7 000	100	7 100
Other ACT	1 400	700	2 100
Total	31 100	9 600	40 700

(1) Includes Erindale Centre.

Table 93 Relationship between Population Settlement and Employment Opportunities in the Plan Period

Settlement Area	Population			Employment		
	Existing (1982)	New	Total	Existing (1982)	New	Total
Belconnen	77 000	6 000	83 000	15 200	6 700 – 8 700	21 900 – 23 900
Gungahlin	-	84 000	84 000	740	15 160 – 20 160	15 900 – 20 900
Inner Canberra	59 400	2 600	62 000	67 650	20 450 – 25 450	88 100 – 93 100
Tuggeranong	32 800	56 200	89 000	2 930	19 270 – 24 270	22 200 – 27 200
Woden-Weston Creek	59 950	50	60 000	16 300	1 800 – 3 800	18 100 – 20 100
Other ACT	1 300	300	1 600	1 400	700	2 100
Queanbeyan	20 150	9 850	30 000	6 000	2 000	8 000
Total	250 600	159 000	407 600	110 220	66 080 – 85 080	176 300 – 195 300

Offices

Background and Intent

The location of office employment has been the major mechanism in the implementation of the policies of employment dispersal and the creation of town centres. This is reflected in the dominance of offices in the employment composition of the Woden and Belconnen Town Centres - approximately 55 per cent of employment at the Woden Town Centre and 65 per cent of employment at the Belconnen Town Centre is in office employment. Public Service Act employment is particularly important as it comprises the bulk of office employment in Canberra and is less difficult to direct to dispersed locations than private-sector office employment.

Policy

The Central Area, the existing town centres in Woden and Belconnen and the proposed town centres in Tuggeranong and Gungahlin, will be the major locations for office activity within the limitations imposed by traffic and environmental considerations. The Commission will monitor the progressive performance of the centres and the total transport system, and office developments which would have a detrimental effect on the transport system or the planned strategy of centres will not receive planning support.

Office developments over 500m² will only be permitted in the Central Area, town centres or Deakin Section 37, in order to optimise the benefits of the shared use of facilities such as car parking; to provide for the shopping and social needs of the office workforce; and to avoid traffic intrusion into residential areas.

Table 94 shows the intended levels of office employment in the major centres. A range of office employment is given for the major nodes. As the level of office employment to be distributed is about 29 500, it follows that not all nodes can grow to the maximum levels shown.

Table 94 Intended Distribution of Office Employment in the Plan Period

Location	Office Employment Opportunities		
	Existing (1982)	New	Total
Anzac Park	1 000	-	1 000
Civic Centre	11 700	5 800 – 7 300	17 500 – 19 000
Parkes/Barton	8 000	2 000 – 4 000	10 000 – 12 000
Russell/Campbell Park	6 600	4 300	10 900
Other North Canberra	2 900	-	2 900
Belconnen Town Centre	5 200	1 800 – 2 800	7 000 – 8 000
Gungahlin Town Centre	-	4 000 – 6 500	4 000 – 6 500
Tuggeranong Town Centre	-	6 500 – 9 000	6 500 – 9 000
Woden Town Centre	5 100	900 – 1 900	6 000 – 7 000
Other Canberra	3 100	400	3 500
Total	43 600	25 700 – 36 200	69 300 – 79 800 (1)

(1) It is estimated that the total level of office employment will be approximately 73 100.

The figures indicated in Table 94 show levels of dispersal which the Commission intends to work towards in the implementation of the Metropolitan Policy Plan. Their achievement will be contingent upon such factors as:

- Commonwealth Government office dispersal to implement the employment level in Tuggeranong and Gungahlin Town Centres
- Commonwealth Government construction of office space
- the need for support from other organisations
- private sector investment decisions.

Industry

Background and Intent

The Commission is responsible for the planning, design and construction of industrial estates and the servicing of sites within the estates for release by the Department of Territories and Local Government.

The locational requirements of industrial firms vary widely. Factors which affect the variations include the market served, the source of raw materials and labour, the mode of transport utilised, and the compatibility of adjacent land uses.

To accommodate these demands, industrial estates have been established in Fyshwick, Mitchell and Hume. These estates cater for manufacturing, processing, warehousing, storage and regional service trades activities.

The industrial areas as developed have a higher level of office and retail activity than was intended. The industrial activities that do exist largely serve the Canberra region.

Policy

In order to preserve industrial land for industrial purposes, and to ensure the implementation of planned metropolitan retail, office and industrial centres, retail and office uses not ancillary to, or directly related to, the industrial or service trade function carried out on a site will not receive planning approval.

It is proposed that, for the foreseeable future, industrial development will be located in the existing main industrial areas of Fyshwick, Mitchell and Hume, and in the Canberra Technology Park in Bruce, which will be developed to provide for high technology industrial development. An area at West Belconnen is also reserved for long-term industrial site needs. Table 95 shows the intended distribution of industrial jobs in these areas for the plan period.

The Commission intends to introduce selective planning measures in the existing industrial areas to improve environmental and traffic conditions.

Industries which would create a nuisance by the generation of hazardous waste material, noxious odours or excessive noise will not be permitted adjacent to existing or future urban or recreation areas. Such industries will be required to locate in the special industrial area at Harman. Industries which create a special nuisance through the generation of hazardous liquid wastes and groundwater pollutants will be required to have approved pollution control systems, in order to protect the water quality of local rivers, streams and aquifers. Where adequate protection cannot be achieved, such industrial uses will not be permitted.

Table 95 Intended Distribution of Industrial Employment in the Plan Period

Location	Employment Opportunities						Total
	Existing (1982)			New			
	Industrial	Other	Total	Industrial	Other	Total	
Bruce	85	1615	1700	800	500	1300	3000
Fyshwick	1410	6890	8300	500	200	700	9000
Hume	90	140	230	2270	1500	3770	4000
Mitchell	70	670	740	2160	1400	3560	4300
Total	1655	9315	10970	5730	3600	9330	20300

Population, Land and Housing

Background and Intent

The population growth forecast for Canberra represents the probable growth of the population based on present knowledge of the trends which affect population change. The forecasts reflect the expected growth in population in the ACT, in response to continued growth in the local economy and its attraction as a place to live. The factors which influence population growth will be monitored and the forecasts reviewed periodically.

The population forecasts indicate the need for about 45 000-48 000 new standard residential housing sites and 12 000-15 000 new medium-density housing sites within the planning period. Within the existing settled areas, only a small amount of this need can be accommodated as shown in Table 96.

Table 96 Housing Sites in the Existing Settled Areas - June 1983

Settlement Area	Housing Sites	
	Standard	Medium-Density
Belconnen (1)	4 200	2 300
Inner Canberra (2)	250	800
Woden-Weston Creek	1 100	900
Total	5 550	4 000

(1) Includes Belconnen Naval Station.

(2) Excludes redevelopment.

In the short-term, that is the next 6-8 years, it is not possible to supply serviced land in Gungahlin, because of the lead-time required to provide the major infrastructure. Nor is it realistic to expect that redevelopment in Inner Canberra would do much to alleviate the demand for new housing or land in the short to medium-term.

The immediate need for large numbers of new housing sites can only be met in Tuggeranong, where the additional population settlement can be accommodated on land east of the Murrumbidgee River to a level of about 85 000-90 000 population. The visual catchment from Lanyon Homestead will be preserved and is to remain clear of urban development. While population is being settled in Tuggeranong, the work necessary to produce housing sites in Gungahlin can be undertaken, in order to ensure continuity of supply before the land in Tuggeranong is exhausted.

Throughout the period of urban expansion in Tuggeranong and Gungahlin, redevelopment of the older parts of Canberra will be increasing in response to demands by small households, single adults and groups for medium-density housing close to the main employment nodes in the Central Area and to the entertainment and cultural activities located in Civic Centre. As the available large parcels of undeveloped land within the bounds of the existing metropolitan area are developed, the pressure for infill will rise and available small areas of vacant land designated for housing will be developed.

Experience has shown that residential areas of about 4 000-5 000 people form a community of interest and provide the necessary threshold for the provision of facilities such as schools, neighbourhood shops and recreation areas.

On the basis of the success of the neighbourhood concept in the development of new residential areas in Canberra, the Commission intends that, in future, neighbourhood principles will form the basis of residential area planning in new settlement areas.

Policy

The urban area of Canberra will continue to be a series of separate towns located in valleys and framed by an open space system of hill and river corridors. For the foreseeable future, Metropolitan Canberra will comprise:

- the existing developed towns of Inner Canberra, Woden-Weston Creek and Belconnen
- Tuggeranong, which will be developed on the east bank of the Murrumbidgee River into Lanyon, to accommodate an eventual population of 85 000-90 000
- the new town of Gungahlin which will occupy land to the north of the Federal and Barton Highways and will accommodate an eventual population in excess of 80 000.

Within each town will be a series of residential neighbourhoods, based on safe and convenient access to schools and community facilities, and having sufficient shops and open space to cater for neighbourhood needs. A hierarchy of roads will control traffic within residential areas and divert through-traffic to the arterial road system running between the neighbourhoods and defining their spatial limits. In general, residential areas will be neighbourhood units with a population of about 4 000-5 000, this being the catchment population required to support a primary school and other local community facilities.

Government housing in new neighbourhoods is dependent on needs and government policy, but could comprise up to 30 per cent of the total housing units and will be distributed throughout the neighbourhoods in clusters of not more than 25 dwelling units.

Medium-density housing in new residential areas will normally be approximately 20 per cent of the total dwelling stock, although this will be dependent on market needs. The preferred locations for medium-density housing are:

- adjacent to town centres
- adjacent to the principal public transport routes
- adjacent to group and local shopping centres
- available locations in Inner Canberra which have been the subject of community agreement.

Any proposals for urban intensification will be considered only after local area studies have been undertaken and detailed policies considered. The Commission will actively pursue studies aimed at preparing and publishing policies on an area-by-area basis.

Retail

Background and Intent

An essential part of the Metropolitan Plan is the strategic location of shopping with employment. Shopping centres attract traffic movement and have an essential role in the everyday life of urban areas which ensure their importance in land use and transport planning. In addition, shopping activity is closely related to other elements in the Plan, such as population on which it depends for expenditure; to employment which it creates; to transport upon which it relies for access but with which it may be in conflict at the local level; and to the built environment which it helps to shape and change through development.

The factors leading to the development of the retail policy for Canberra are summarised under three main headings: consumer needs, retail economics and environment. The forecasts of likely shopping demand are discussed in Chapter 4.

- **Consumer Needs**

Within the planning period, about 216 000m² of new retail floorspace at planned retail centres will be required to cater for consumer needs. Allocation to the different levels of the hierarchy including town, group and local centres, will be decided by the Commission in the light of available knowledge, advice of retailing and consumer needs, and community preferences. Future growth in shopping demand arises from increases in consumer spending, which, in turn, is closely related to changes in population and its life cycle changes. In the existing settlement areas of Inner Canberra, Woden-Weston Creek and Belconnen, a substantial amount of retail floorspace exists. The levelling-off of the town catchment populations considerably reduces the need for additional facilities in these towns during the next ten years. Most of the need will be generated by the principal growth areas in Tuggeranong and Gungahlin. It should be noted that Tuggeranong already has a significant shortfall of retail provision as compared to other parts of the metropolitan area.

The continued attraction of Civic and the town centres in Belconnen and Woden will allow these centres to continue to cater for and compete in comparison goods shopping. At the same time, the location of new population in Tuggeranong and Gungahlin affords a complementary opportunity to provide new and accessible shopping centres in these areas.

- **Retailing Economics**

Trends in retail economics are relevant in determining retail policies. There is a continuing trend towards larger-scale retailing, both because of a substitution of floorspace for labour, and because of an increasing need for storage space.

- **Environment**

Redevelopment, improvement or expansion of some existing shopping centres may enhance the shopping environment in some parts of Canberra and may also resolve some problems where physical, as well as economic, obsolescence is a problem. However, these needs must be weighed against the impact on the total environment of the centre itself and the area adjacent to it, the impact on the transport system and the urban structure proposed for the City, and the overall public benefit that would result from the decision to allow such change.

In adopting the retail hierarchy and broad proposals to achieve a socially desirable and economically effective distribution of retail floorspace, the Commission has to balance the economics of retail marketing with the needs of the consumer, the need to ensure transport accessibility and the possible environmental impacts on the existing centres and residential areas.

The policy for retailing is intended to optimise resource use and investments while making the fullest use of existing and committed resources; to prevent traffic intrusion into residential areas and maintain air quality to acceptable standards in the major centres; to provide a range of opportunities for shopping; to enable good access to the major centres; to enable new development to be implemented in such a way as to cause least disturbance to the existing urban areas; and to provide a framework which allows for further changes in retail structure and consumer needs to occur without the need for extensive Plan modification.

Policy

It is considered that about 1.4m² per capita of retail floorspace is supportable in planned retail centres in Canberra. This will be used as a guide to future retail planning. It is the Commission's intention to encourage an adequate provision of retail space that meets the needs of consumers for convenience, comparison and specialist shopping, and retailers' operational requirements, as appropriate at the local, town and metropolitan levels in terms of location and size of centres. Apportioned to each level of the hierarchy the 1.4m² per capita provides the following approximate allocation of space per capita: 0.9m² at Civic Centre and the town centres; and 0.5m² at group and local centres. Adjustments to the provision of individual centres may be required to take account of specific circumstances such as overlapping catchments or other factors affecting demand at that centre, such as work-based expenditure or escape spending. The Commission will make an assessment of the retail floorspace supportable in a town, and its appropriate distribution, in considering proposals for expansion or change of use in centres which might have a significant effect on the planned system of retail centres.

The Commission will maintain and extend the system of shopping and community centres by distributing future retail floorspace and complementary community facilities in accordance with a hierarchy that comprises:

- Civic Centre
- Town Centres
- Group Centres
- Local Centres

Civic Centre

The Commission intends that Civic Centre should develop as the most specialised retail centre serving both metropolitan and special markets such as tourism. However, decentralisation of retail opportunities will be continued and will be related to consumer needs, retail economics, transport accessibility and equity considerations.

Town Centres

The focal point and highest order central place of each town will be a town centre containing major employment, community and commercial facilities and services, as well as retailing.

Because of the existence and extent of overlapping catchments at the town centre level, and the fact that town centres are a key element of Canberra's urban structure, any changes to the size, structure or operation of Woden and Belconnen Town Centres will be carefully evaluated in terms of the metropolitan implications. No additional retail floorspace will be permitted at Woden and Belconnen Town Centres, beyond that which can be shown to be generated by the populations within their respective town catchments. Neither Woden Town Centre nor Belconnen Town Centre will be encouraged by the application of planning policies or by development works to become the main metropolitan retail centre.

Town centres will be developed in Tuggeranong and Gungahlin. The retail components of Tuggeranong and Gungahlin Town Centres will be related to the town catchment, employment opportunities within the respective town centres and the metropolitan retail system. In order to accommodate retail-related uses requiring large floor areas or low rental space, it is intended to provide mixed-use areas as distinct from the retail cores and the main service trades areas of centres. A closer physical integration of these functions will be sought in the future.

Table 97 shows the intended distribution of retail floorspace to Civic Centre and the town centres for the plan period.

Table 97 Intended Distribution of Retail Floorspace to Civic Centre and the Town Centres in the Plan Period

Location	Retail Floorspace (m²)	
	Existing (1982)	Intended
Belconnen Town Centre	67 300	69 800
Civic Centre	60 800	75 800
Gungahlin Town Centre	-	47 000
Tuggeranong Town Centre	-	40 000-50 000
Woden Town Centre	67 900	70 400

Group Centres

Group centres provide the opportunity for major weekly shopping and for the location of retail and personal services requiring a catchment larger than that of a local centre, but smaller than that of a town centre. Group centres will provide supermarkets and other retail, commercial, and community facilities and services. The development of group centres will be restricted to that level which serves the needs of their respective local catchments.

Local Centres

The Commission will meet needs for local retail and community facilities by maintaining an effective system of local shopping centres and providing opportunities for private development. Proposals for extending local centres will be considered in relation to the needs of the people living in the local area and the impact of such proposals on the amenity of adjacent residential areas. Proposals will only be supported where it can be demonstrated that they fulfil a local need.

Transport

Background and Intent

The transport system comprises the road network, car parking facilities and public transport. The efficiency of the total system depends not only on the physical provision of infrastructure, but also on the operational policies adopted for the use and control of facilities, for example, road traffic management measures, parking charges and the fare levels of the bus services. The Commission provides the infrastructure and associated facilities, and, in conjunction with the Department of Territories and Local Government, formulates the broad policy for the system. In turn, the Department determines operational policy and maintains and operates the system.

The importance of the interaction between land use activities and transport has been emphasised by the work done in reviewing the Plan. This has clearly indicated that it is the disposition and size of the centres for major employment and shopping which places different demands and stresses on the transport system and the physical fabric of the City.

The major problems revealed in evaluating the options for the future development of Canberra will be difficult to overcome. They are:

- a heavy concentration of movement in the morning and evening peak periods, due to journeys to and from work
- the need to devise a system of roads and parking facilities to adequately meet movement demands, particularly in the peak periods and within and on the approaches to the Central Area and town centres, in order to avoid congestion, danger and delays, but to do so within the constraints of efficient expenditure
- the need to resolve the conflict between meeting the needs of traffic and other uses, in order to avoid undue hazards to pedestrians and possible harmful effects on the environment from noise and fume emission and impairment of the visual quality of the urban fabric.

To some extent, the hierarchical system of roads, developed successfully in the new towns of Canberra, has minimised the impact of those kinds of problems to date, providing a high standard of safety and service to all road users. With regard to the provision of car parking and the related question of public transport, the proposals in the 1980 *Metropolitan Issues-Public Discussion Paper* to constrain the level of car parking at major employment and retail nodes and increase the provision of public transport services, drew strong adverse comments from motorists using long-stay parking at existing major nodes.

The transport policy is intended to overcome existing and potential future problems by protecting the Central Area from traffic pressures that might otherwise overwhelm it; through the efficient operation of the total transport system; by preventing traffic congestion and traffic intrusion into residential areas; and by minimising the impact of noise and fumes emission.

Policy

Road Network

The hierarchical system of roads, comprised of parkways, arterials, sub-arterials, distributors, collectors and access roads, will be continued in the future development of the City. Existing road patterns in other parts of Canberra will be improved to reflect this system wherever possible. In addition, traffic congestion will not be promoted as a method of traffic management or to encourage the use of alternative transport modes.

The metropolitan road network will be extended and improved in the plan period in order to meet movement demands, particularly in the peak periods, to provide a well defined primary network for longer-distance movements within the metropolitan area and to minimise congestion within and on the approaches to the Central Area and town centres. Improvements to the metropolitan road network will be carried out in conjunction with development of an adequate supporting secondary network for local access and movement.

Public Transport

The public transport policy aims at achieving a balance between public transport capacity and road capacity, as improved public transport and an efficient road system are to a large extent interdependent.

In future the Commission will, in conjunction with the Department of Territories and Local Government:

- support the continuation and future planned expansion of a comprehensive system of bus services operating on the road network. The level of service will be commensurate with the City's financial ability to meet the needs of those dependent on bus travel
- encourage people to use public transport as the means of travel to work
- continue to implement a programme of providing bus priority lanes along congested routes with high bus flows, where benefits can be realised without significant restraint on general traffic movement or causing adverse effects on amenity by diverting traffic into local roads through residential areas
- continue to provide centrally located bus interchange facilities in the town centres of each of Canberra's towns
- continue to investigate routes for express inter-town buses. Routes which are reserved will be capable of design to ensure frequent and relatively fast services, in order to create an attractive alternative to travel by private car. Routes for detailed investigation are those which will provide access from each of the existing and proposed town centres to the Central Area.

Parking

General

The provision of off-street parking will be the responsibility of developers. They will be required to either construct or contribute towards the construction of parking facilities, as determined by the Commission, in conjunction with the Department of Territories and Local Government. A mechanism will need to be developed to enable this. The size of facilities required will be related to the activities proposed within the development. The size and location of facilities will be such that they will not cause environmental damage or inhibit the movement of traffic in the surrounding street system.

The amenity of residential areas adjacent to town centres and other employment centres will be protected from the intrusion of car parking by the application of development controls and traffic management measures.

Civic Centre and the Town Centres

The Central Area will continue to be the major metropolitan centre of employment and Civic will be developed as the major metropolitan commercial centre. In the planning period, the number of jobs in the Central Area will increase by between 43 per cent and 55 per cent and the amount of retail floorspace may increase by 25 per cent. In Civic, because some existing car parking sites will be required for development purposes, between 7 000 and 12 000 spaces of the total requirement of 15 000 to 22 000 spaces will need to be provided in structured car parking.

The existing town centres in Woden and Belconnen and the proposed town centres in Tuggeranong and Gungahlin will be the next most important metropolitan retail and employment centres. Table 98 shows the levels of car parking related to those needs.

Table 98 Car Parking Demand at Civic Centre and the Town Centres in the Plan Period

Location	Employ- ment	Existing (1982)			Employ- ment	Expected Demand		
		Retail (m ²)	Structured Parking	Surface Parking		Retail (m ²)	Structured Parking	Surface Parking
Civic Centre	16 000	60 800	-	12 000	25 000 – 27 000	75 800	7 000 – 12 000	8 000 – 10 000
Belconnen Town Centre	8 000	67 300	1 700	6 800	13 000 – 15 000	69 800	1 700 – 4 000	8 200 – 10 500
Gungahlin Town Centre	-	-	-	-	7 000 – 12 000	47 000	-	5 200 – 8 800
Tuggeranong Town Centre	-	-	-	-	12 000 – 17 000	50 000	-	9 000 – 11 800
Woden Town Centre	9 300	67 900	-	7 500	11 000 – 13 000	70 400	0 – 1 500	8 400 – 9 600
Total	33 300	196 000	1 700	26 300	68 000 – 84 000	313 000	8 700 – 17 500	38 800 – 50 700

National Capital Open Space System

Background and Intent

While each type of area in the National Capital Open Space System has its own use and character, they are all interrelated as a total landscape open space system. Consequently what is done in one area has an effect on other areas. This requires the open space to be planned, developed and managed as an integrated system.

At this stage of planning, the proposals and policies for the open space system can only designate the broad use areas, general intentions and the nature of the interrelationship of areas, so that each area can be placed separately as a distinct problem, but with a clearly defined and constant relationship to the whole of the open space system.

It is not intended that the National Capital Open Space System be developed or managed as traditional public open space or parkland. It is intended to be a multiple-use area with different parts of the system having different planning and management policies reflecting the characteristics of the land. Areas will be defined for intensive recreation, conservation and open space uses but other lands would be leased for rural purposes and other specific uses appropriate to the objectives and policies set for the specific part of the system.

Policy

The following policies apply to the whole of the National Capital Open Space System:

- **Landscape**
The National Capital Open Space System will be preserved and enhanced as an essential part of the scenic background and landscape setting to the National Capital. The preservation and enhancement of the landscape character and diversity is the objective against which all proposals for use and development will be measured.
- **Land Use and Access**
The National Capital Open Space System will be planned so as to facilitate and improve visual and physical access and provide a balanced range of recreational opportunities and other uses in a manner that reinforces the National Capital Open Space System as a diverse ecological, cultural, scenic and recreational resource. It will also provide a land bank for future National Capital and recreational needs.
- **Conservation and Resource Protection**
The ecological, recreational, cultural and scenic resources of the National Capital Open Space System will be protected consistent with usage, providing for the best use of each part without degrading its desirable condition or the quality of the experience.
- **Management**
Planning and development of the open space system will be integrated with effective management that sustains specific uses and recreational activities consistent with conservation, landscape protection and other planning policies.

Specific area policies give the planning intention for the components and the different types of areas within the National Capital Open Space System. These include:

- River Corridors
- Hill Areas
- Mountain and Bushland Areas
- Pine Plantations
- Rural Landscape Foreground Areas
- Special Interest Sites.

The policies for other areas will be progressively defined as further detailed planning studies are undertaken.

River Corridors

The river corridors are key elements in the Canberra landscape and provide a diverse ecological, scenic and recreational resource which is increasingly being used, by both residents and visitors, for a variety of recreation activities, particularly sightseeing, swimming, picnicking, nature study, fishing, canoeing and walking.

The boundaries of the Murrumbidgee and Molonglo river corridors define in part the 'Areas of Special National Concern'. A unified approach to the planning, development and management is required if the essential landscape and environmental qualities of the river corridors are to be retained.

The landscape and ecological continuity of the river corridors will be preserved and reinforced. Recreational opportunities and other uses are to be provided consistent with maintenance of environmental values.

Specific objectives which will guide the planning of the river corridors are:

- prevention of deterioration of water quality either from external influences that impact on the river or from the nature of the river corridor usage
- preservation of areas of existing natural vegetation in a relatively undisturbed state
- repair and rehabilitation of damaged areas, including revegetation where necessary
- provision of a range of riverside recreation as best suited to the resource in terms of its physical and ecological capacity
- protection as far as possible from external effects, such as uncontrolled access, visual intrusion, excess nutrients and wildfire
- maintenance of ecological continuity along the corridor for migrating fish and wildlife populations
- provision of a planning and management strategy which sustains specific land uses and recreational activities consistent with the objectives.

Hill Areas

One of the greatest attractions of Canberra is that from almost anywhere in the City the ridges and slopes of the hills can be seen, with their varied pattern of partially wooded grassland and views to the mountain ranges beyond.

Certain of the hills closer in are visually more important than others. The most important are those which can be seen from the national areas of Parkes and Barton. The next in order of importance are the hills and ridges that shape and contain the urban areas. Other hills have local importance because they are visually prominent from main approach roads or are part of the river corridors.

The hill areas will be preserved from urban development and their essential environmental and landscape character will be retained and reinforced so as to provide a unified landscape setting for the National Capital.

Multiple-use of the hill areas, including special development and service corridors for public utilities, will be permitted provided the proposed use is appropriate to the landscape and environmental intentions for the area concerned.

Mountain and Bushland Areas

The most impressive views from Canberra are those into the Brindabella and Tidbinbilla mountain ranges that rise in the southern and western parts of the ACT beyond the Murrumbidgee River. This mountain and bushland area has a wide variety of different landscapes from high mountains, snow covered in winter, to foothills, rainforest valleys and alpine meadows, other bushland and open valleys, all of which contribute to its value as a scenic, ecological and recreational resource.

This area also encompasses the Cotter and Gudgenby water catchment areas and the Tidbinbilla and Gudgenby Nature Reserves.

The mountain and bushland areas that have remained relatively undisturbed and are not required for water supply reservoirs and associated works will be preserved and protected as nature conservation, wilderness and bushland recreation areas. The usage and access will be controlled to a level that will prevent environmental deterioration that would significantly detract from the quality of the area or the experience of use.

Any development will be kept to the minimum required for public appreciation of such areas and if practicable will be confined to the perimeter or to the surrounding buffer zones.

Pine Plantations

Softwood forestry is one of the few resource-based industries in the ACT and the pine plantations, because of their proximity to the urban areas, provide for high levels of recreation use.

Although some of the effects of extensive pine planting in the landscape can be criticised on aesthetic grounds, pine forests, if carefully sited and developed, can add interest to the landscape. They help to emphasise the shapes of the land forms and add colour and variety to the general scene.

Pine plantations will be retained where appropriate as multiple-use areas for other uses compatible with the primary productive purposes.

Rural Landscape Foreground Areas

Rural landscape foreground areas are those rural lands associated with the National Capital Open Space System which, while not necessarily visually significant when considered in isolation, form a foreground to panoramic views beyond.

Because of this association with the National Capital Open Space System it is important to retain the essential rural landscape character of these areas and not permit uses that would break down the scale and appearance of the countryside and intrude into the main view.

The retention of these rural landscape areas would also ensure representative examples of the typical Australian countryside close-in to the National Capital as visible links to Canberra's rural past.

The importance of the rural landscape foreground areas associated with the National Capital Open Space System, particularly Bulgar/New Station/McQuoid Creeks area, south-west Molonglo, Lanyon/Riverview, Pialligo/Dairy Flat, Paddys River Valley, and Booroomba, will be recognised in future planning. These areas will be subject to local policy and development plans aimed at retaining the pastoral character of the land while permitting appropriate National Capital and other Commonwealth uses that are compatible with rural usage in maintaining the broad landscape character.

Special Interest Sites

There are a number of ecological, geological, archaeological, historical and cultural sites within the National Capital Open Space System. They are of scientific, educational or public interest because they have a restricted occurrence in the ACT and the surrounding region or because they have historic and cultural associations with Canberra's past.

These sites will be preserved and protected for the purposes of research, education and public interest and appropriate settings will be maintained or created on these sites.

A survey of the Territory has been initiated to identify and classify special interest sites. Areas identified and classified will be subject to local policy and development plans aimed at providing an adequate level of protection.

Recreation and Tourism

Background and Intent

Recreation and tourist facilities are highly interrelated in the ACT. Local recreation facilities are used by visitors to the National Capital while tourist attractions are visited by large numbers of Canberra residents.

An important component of the outdoor recreation facilities available in the ACT is the National Capital Open Space System which provides recreational opportunities for the whole metropolitan population. The Commission is responsible for the design and construction of many other recreation facilities including sports fields, playgrounds and swimming pools. Private enterprise and community groups also provide both indoor and outdoor leisure facilities, such as squash courts and golf courses.

As Civic Centre is closely associated with the tourist facilities in the Central Area, it has the potential to develop as a major metropolitan focus for tourism. Expansion of tourist activities would help Civic to develop a metropolitan role by encouraging development in specialist retailing and entertainment. An area has been designated in Civic Centre where emphasis will be given to the co-location of commercial accommodation and tourist attractions.

Policy

The Commission's policy in relation to recreation and tourism is to encourage, in conjunction with private enterprise and community groups, an adequate and balanced provision of recreation and tourist facilities to meet the needs of residents of the ACT and tourists to the National Capital.

Recreation facilities will be provided on a hierarchical basis so that facilities with a metropolitan catchment are easily accessible to all of the residents of the ACT, and facilities with a local catchment are located within residential neighbourhoods.

Inner Canberra is to remain the central focus for tourist attractions associated with national capital and metropolitan functions and for tourist accommodation.

New private enterprise tourist attractions are to be grouped in Civic Centre or the Special Tourist Commercial Area at North Watson, rather than be dispersed throughout the City. Tourist-related development may also be located within the National Capital Open Space System, at special development sites identified for that purpose.

Community Facilities

Background and Intent

Generally, the Commission does not determine the need for community facilities, but responds to requests from client authorities such as the Department of Territories and Local Government, the ACT Schools Authority and the Capital Territory Health Commission.

In response to these requests, the Commission selects sites and designs and constructs a range of community facilities for welfare, youth, cultural, educational, health and municipal services.

At the metropolitan level the most important community facilities the Commission plans and develops for client authorities are those related to education and health.

Policy

Education

The Commission will select sites and design and construct government education facilities, in conjunction with client authorities and in accordance with forecast population characteristics and development programmes. Education facilities will be designed to allow maximum use by the community and to ensure integration with complementary and compatible land uses. The Commission will facilitate the development of private education facilities by the selection and servicing of appropriate sites.

Health

The Commission will select sites and design and construct government health facilities in conjunction with client authorities to facilitate the provision of health care to the community.

The Commission's role in the development of private health care facilities is the selection and servicing of suitable sites.

Urban Environment

Background and Intent

The policies and development proposals of the Plan concentrate on strategic matters affecting the function, scale and location of activities in Canberra. However, the success of the Plan will be assessed in the minds of many observers not only by how well the City works but also by how it looks and how pleasant it is to live in.

In general, the urban environment of Canberra is of a high quality compared to other Australian cities. This is to be expected, given its role as the National Capital and its development, since its inception, to an overall design concept.

With the planned interrelationship of all public landscape design and the high standard of private landscaping, Canberra has become a unique landscaped city. In fact, landscape design and development have made a major contribution to the overall design and development of the City.

The origin of the Canberra landscape was in the 1912 prize-winning plan by Walter Burley Griffin. Griffin recognised particularly the importance of the hills and river corridors as features capable of providing a basis for the design of the City and a guide to modification of the landscape.

The Commission's broad landscape principles have been: first, to unite the urban elements of Canberra - the buildings, engineering structures, roads and spaces - into a unified design related to the surrounding countryside; second, to achieve a completed appearance in a given area in a short space of time; and third, to provide an environment for human activity and enjoyment both for the present as well as the future.

The older residential suburbs are dominated by their landscaping, with built elements being obscured by the vegetation in private and public spaces. The fact that trees obscure any buildings less than three storeys high gives great impact to those buildings that rise higher, as they are seen against a backdrop of vegetation.

Most of the effect of landscape development in suburban areas has been achieved by planting in public spaces - streets, parks and the sites of public buildings. The residential landscape thus created is reinforced by arranging arterial roads so that the larger open spaces are apparent to tens of thousands of drivers each day and the resulting traffic is removed from residential areas.

Urban development does not appear on the skyline of Canberra's hills and ridges. Rather, development is hidden in the folds of the hills amongst landscaping, giving the City a predominantly low setting. In Civic Centre and the town centres, the establishment of contrasting building masses accommodating the urban activities has occurred through the development of buildings rising above the tree canopy. However, even tall buildings are subordinate to the landscape, reflecting the capacity of the landscape to absorb large developments and yet retain its dominance.

Commercial buildings in the national areas reflect the need to limit height in the interest of the National Capital functions, and make their presence felt through continuity in massing, colour, form and materials.

Care has been exercised with the siting and landscaping of unsightly uses or developments on new sites. Similarly, care has been taken with urban uses in the rural areas to preserve the quality and scale of the countryside.

The policy is intended to continue the garden city concept and to delineate the main activity centres by strong vertical elements of building mass penetrating the landscape canopy. It is intended to provide a distinctive setting for the National Capital by enhancing the land forms and scenic setting of Canberra, and to maintain and continue the creation of attractive living environments.

Policy

The urban environment policy is to ensure harmony of buildings and landscape and thus give effect to Griffin's concept of a garden city, which is the foundation of design in Canberra.

The design and landscape principles as developed for Canberra will be retained and utilised for the expansion of the City. New urban settlement areas will be built in adjoining valleys and be separated from one another by preserving open spaces and the intervening hilltops in their natural state. This will be reinforced by the development of the National Capital Open Space System, which recognises the value of these spaces along with the 'Areas of Special National Concern' defined in the Commission's *Design and Siting Policies*.

Rural and Non-Urban Areas

Background and Intent

The rural and non-urban lands of the ACT provide a distinctive setting for the National Capital, act as an integral part of the City's open space system and provide a land bank for future land use and activity needs, as the City grows and changes. Such needs include special activities directly related to Canberra as the National Capital; defence, scientific and institutional uses; recreation and nature reserves; and other activities incidental to the development of the City.

Rural lands contain significant natural resources such as rivers, streams, land forms, flora and fauna which need protection while the land is under rural management, in order that these resources might be integrated into the activities of the present and future City and its environs.

The policy for rural and non-urban lands is intended to make the fullest use of natural resources by wise management and to conserve the natural setting of the ACT. It is also intended to safeguard the future land bank of the City and to avoid difficult land assembly and high future acquisition costs if and when the lands are required for other Commonwealth purposes.

Policy

The maintenance of the rural surrounds of Canberra as representative of Australia's rural landscape is an important consideration in planning land use in the Territory. Together with the National Capital Open Space System, the rural areas not required for other purposes will be retained as part of the landscape environs of the National Capital.

Rural and non-urban land should be used generally only for grazing purposes by stock, which will not significantly alter or degrade the land's natural resources. Intensive farming will be strictly controlled. Where possible, rural leases should be amalgamated in order to provide economic grazing and for ease of land assembly, should the land be required for future Commonwealth purposes. Accordingly, the subdivision of existing holdings into smaller blocks will be opposed. The natural tree cover on rural and non-urban land is an important landscape element assisting in preventing soil erosion. Clearing for grazing and other rural activities, including the planting of exotic forest, will also require planning permission and strict management controls.

Hobby farms and rural residential retreats are not considered to be bona fide rural activities. Such uses fragment viable rural holdings, often mar the open rural landscape, are costly to provide with services, create difficulties for future land assembly and, generally, lead to higher acquisition costs when the land is required for Commonwealth purposes. Applications for planning permission for these uses will not be supported.

Some rural leases close to the urban area are being transformed into rural/residential retreats by the construction of large houses unnecessary for the operations of the rural holdings. Such developments will be prevented in future by requiring built improvements on rural land to be limited to those which are essential to the operation of the rural activities being carried out, on land of sufficiently large area to sustain viable agriculture or grazing. Activities involving intensive agriculture or grazing will be subject to special consideration. Generally, where the rural holding is of an acceptable size an application for a single dwelling house with essential rural out-buildings will receive favourable planning consideration and the connection of available services. Generally, an application for multiple

dwelling houses will be opposed by the Commission; where applications are supported, a condition of approval will be that compensation for acquisition will be waived for all improvements except one dwelling house nominated by the Commonwealth.

Public Utilities

Background and Intent

The most significant public utilities the Commission plans for at the metropolitan level are those related to water resources and energy supply and other essential services.

The water resources of the ACT are used for a wide range of purposes, including water supply, the discharge of wastes and surface runoff to streams, and recreation. Water resources are incorporated into the metropolitan area as an integral part of the urban landscape.

A number of these purposes have quality and quantity attributes that need to be protected to secure the full enjoyment of the water resources.

While the use of infrastructure provides a means of modifying impacts, there is often a high cost associated with technological solutions. A range of water resources management techniques have been adopted as the means of providing the services and conditions meeting community aspirations. They comprise:

- land use and management control which is cognisant of the protection of water and associated uses downstream
- the provision of water supply, wastewater and surface water infrastructure
- the management of demand for services.

Essential services comprise electricity, gas, telephones and postal services. Such services influence planning considerations by virtue of their land needs and the environmental effects of their supply structures. Although responsibility for their provision rests with other statutory authorities and private enterprise undertakings, it is necessary for the Commission to take their requirements into consideration in the overall planning of the metropolitan area.

Policy

Water Resources

The ACT Policy Plan (Water Use) will be used as a basis for:

- co-ordination of land and water use planning and management
- co-ordination of the allocation of water resources across a range of competing uses
- co-ordination between the ACT portion of the Murrumbidgee basin and the NSW portion of the basin.

The policy for water catchment areas is to protect the water resource value of catchment areas in order to ensure the economic provision of a supply of safe drinking water, while simultaneously conserving the other natural resources within the catchments themselves, and maintaining their visual integrity.

Exploitation of water catchment areas for grazing, agriculture, forestry and other rural activities, which would significantly degrade their resource value, will be excluded, along with hobby farms, rural/residential retreats and recreation uses, particularly those of a more intensive commercial nature. Uses of an educational, scientific, defence or institutional nature will be considered on the merits of their proposals and particular impacts on the resource value of the catchment.

Although walking trails, fire trails and other essential facilities, needed to manage, protect and allow the study and appreciation of the natural resources of catchment areas may be permitted, they will be subject to strict planning controls and management practices.

The Cotter Catchment Area will be protected in the interest of an economic provision of a safe supply of potable water.

In view of the need to augment water supply in the longer term, the area adjacent to Mt. Tennent on the Gudgenby and Naas Rivers will be reserved as a possible water storage area. The inclusion of a nature reserve within the catchment is consistent with this use.

Water pollution control facilities will be incorporated into urban stormwater infrastructure in Tuggeranong as the basis for the protection of the Murrumbidgee River. A water feature will be developed in Tuggeranong, as a means of protecting the Murrumbidgee River, and as a water-based recreation facility.

The urban form and structure of Gungahlin will make significant use of natural features to contain urban runoff pollution consistent with the protection of Lake Ginninderra and the requirements of urban development.

In view of the high cost of treatment of wastewater to a standard consistent with the protection of inland lakes and streams, economies of scale will be utilised by basing augmentation of wastewater treatment facilities on the Lower Molonglo Water Quality Control Centre.

Energy Supply and Other Essential Services

The intention is to ensure the availability of essential services in close co-ordination with urban development and to ensure that urban development proposals do not place unacceptable demands on essential services. It is also intended that the provision of essential services be achieved with the minimum detriment to the environment, and that sites will be made available in suitable locations.

The Commission will take account of the needs of essential services in making proposals for the phasing and location of development and changes in land use. Proposals for new facilities and installations, including overhead electricity lines, will be approved only in suitable locations in accordance with the general proposals for the area concerned.

Introduction

The purpose of the Development Plan is to indicate those development proposals which are required to meet needs arising from population growth or change. The development proposals indicate the main public works that will need to be carried out by the Commission and other public authorities, as well as indicating development opportunities for the private sector, particularly in terms of new housing, offices and retail facilities. The ability to implement the public works will be subject to adequacy of continuing annual appropriations from the Budget.

The Metropolitan Development Plan has been prepared to:

- identify the Commission's intentions for major development works
- inform other public authorities and the private sector of Canberra's expected growth and development over the next twenty years or so
- inform the public of proposed development works
- highlight the range, type and location of development opportunities likely to arise for private enterprise during the plan period.

The Development Plan translates the needs forecasts (outlined in Chapter 4 in terms of housing units, retail floorspace, etc.) into spatial and programme terms.

In implementing the Development Plan, the Commission will give priority to:

- consolidating development in the existing towns and promoting the orderly expansion of the City
- encouraging the development of Civic Centre as Canberra's metropolitan centre (Central Business District)
- providing centres in the newly developing areas to meet the needs of the local community
- providing adequate traffic access to employment and service centres as Canberra's population grows
- continuing the development of the National Capital Open Space System
- minimising undesirable impacts on the environment, enhancing and protecting the desirable qualities of the existing environment and ensuring that projects, when approved, contain adequate environmental safeguards.

The Development Plan provides a planning input into the Commission's development procedures. The process is complex with

many interactions and has a high degree of flexibility. In general, the process follows a logical production sequence consisting of:

- needs assessments
- three-year construction programme
- design
- annual works programme
- construction
- handover of completed facilities.

The Commission's current practice is to produce Development Plans as a basis for detailed discussions with client departments and authorities, or with representative community groups. Because it is usually necessary to alter the plans during the course of such discussions and as the design evolves, it is not possible to arrive at an 'agreed' plan which remains unchanged after consultation has been completed. By their nature such plans must to some extent remain fluid and adaptive to changing circumstances. Updated development plans are produced periodically as priorities alter and projects are accordingly added to or subtracted from the list. The Commission intends to update the Metropolitan Development Plan on a regular basis and make it available for public information.

The Development Plan provides the basis for two related streams of action. For its part, the Commission will seek programme status and funding for public works. For the private sector, specific development opportunities will need to be identified, through consultations between the Commission and industry and in conjunction with the promotional activities of the Canberra Development Board. Where possible, projects which should or could be carried out by private enterprise are identified in the Development Plan.

Implementation of the Development Plan will rely on:

- achievement of population thresholds for developments directly serving the population
- sufficient support from the private sector, as well as relevant government agencies - that is, agreement about the need for and priority of proposed works.

Development Proposals

The Metropolitan Development Plan deals with the planning and sequencing of the major metropolitan works which are needed to realise the intentions of the Policy Plan. While the implementation of the Policy Plan must evolve over time, some decisions need to be made sooner than others. The main decisions that have to be made now concern the phasing-in of the next settlement area, the location and phasing of office centres, the sequence of major retail releases, the location and design of the major road system and public transport network, the development of facilities for water supply, stormwater drainage and sewerage reticulation, and the development of the National Capital Open Space System. Development projects which are currently considered necessary and which would contribute to the Policy Plan objectives are summarised below in two sections: the first deals with projects in the rural ACT; and the second, with projects in the Canberra urban area.

Metropolitan Canberra Development Plan (ACT)

The rural area of the ACT will come under increasing pressure as additional land is required to meet the growing needs of the City. In addition, Commonwealth Government institutions requiring large sites will continue to occupy land in the rural ACT. These uses will displace grazing or similar interim uses. It is therefore envisaged that, in the very long term, the rural ACT will become predominantly a planned and managed landscape and be visited by greater numbers of tourists to the National Capital (Figure 65).

Consideration as to how the rural ACT will be progressively transformed to meet emergent needs is continuing and inevitably raises complex planning and development issues. For example, to arrest and restore existing deterioration of the natural landscape of the ACT will require a long-term and comprehensive approach, involving ecological and land use studies, planning and implementation.

The major development works required during the plan period in the rural ACT are related to:

- the National Capital Open Space
- forests
- water resources
- National Capital entrance routes
- rural roads.

National Capital Open Space

1. Progressive Development of the National Capital Open Space System

Metropolitan open space is necessary for the long-term environmental protection of river systems, the maintenance of visual quality in the modern city, the provision of adequate outdoor recreation opportunities for those who live in the city and the maintenance of ecological diversity.

The National Capital Open Space System (NCOSS) is a major element of the Y-Plan. It is essential for the long-term achievement of a fitting Australian landscape setting for Australia's National Capital. The NCOSS is also required for the environmental protection of the ACT river system, for, without such protection, further growth of the City would be jeopardised. The NCOSS is a key element in the provision of adequate recreation opportunities for residents and visitors in this large inland city.

The NCOSS will be progressively developed during the plan period to accommodate the diverse demands made upon it by Canberra's residents and visitors. Included will be the development of Kings Park adjacent to Commonwealth Park, other parklands on the foreshores of Lake Burley Griffin, the revegetation of hill reserves and river corridors and the provision of riverside recreation facilities.

A planning and management strategy will be prepared, which sustains specific land uses and recreational activities consistent with the landscape and environmental objectives.

The NCOSS is a special category of land, and its management is considered to be an essential part of its evolutionary development. It will be subject to change over time as part of the long-term planning and development of the National Capital. Long-term environmental monitoring will also be necessary.

- 1 Progressive Development of the National Capital Open Space System - the National Capital Open Space System will be progressively developed to protect river systems, maintain visual quality, provide recreational opportunities, maintain ecological diversity and ensure the ecological stability of urban lands.
- 2 Investigation of Pine Plantations - economic, planning and landscape studies will be undertaken to determine the selective replacement of pine plantations by native species.
- 3 Protection of Water Uses - water quality in lakes and streams will be protected to ensure their designated uses which may include water supply and recreation uses.
- 4 Augmentation of Water Supply - the limits on water resources in the ACT require the protection of possible future sources of supply such as the Naas-Gudgenby Catchment, the restriction of allocation of water to the sub-region and a programme to reduce water consumption.
- 5 Federal Highway Duplication and Upgrading - improvement works will be undertaken to tie in with associated works in New South Wales.
- 6 Reconstruction of Monaro Highway - the road is being progressively upgraded to facilitate movement to and from the Snowy Mountains.
- 7 Upgrading of Cotter Road - the road will be upgraded to improve safety and provide overtaking opportunities
- 8 West Belconnen-Unnarra Road Connection - a road connecting Stockdill Drive with Uriarra Road will improve access for Belconnen residents to Murrumbidgee and Cotter River recreation areas.
- 9 Brindabella Road-Mt. Franklin Road Upgrading, Mt. Franklin Road-Corin Road Connection - these works will complete a tourist route from Cotter to Tharwa via the Brindabella Road, Picadilly Circus, Mount Franklin and Corin Dam.
- 10 Boboyan Road Upgrading - work will continue to upgrade and seal the road to the ACT border.
- 11 Relocation of Naas Road - if the Naas-Gudgenby Catchment is required for water supply and the Tennent Reservoir is constructed, the northern part of Naas Road will need to be relocated higher up the slopes of Mount Tennent.

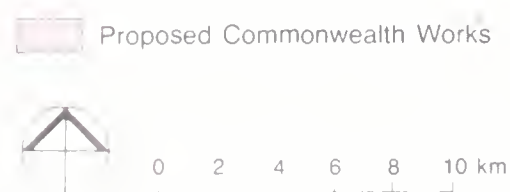
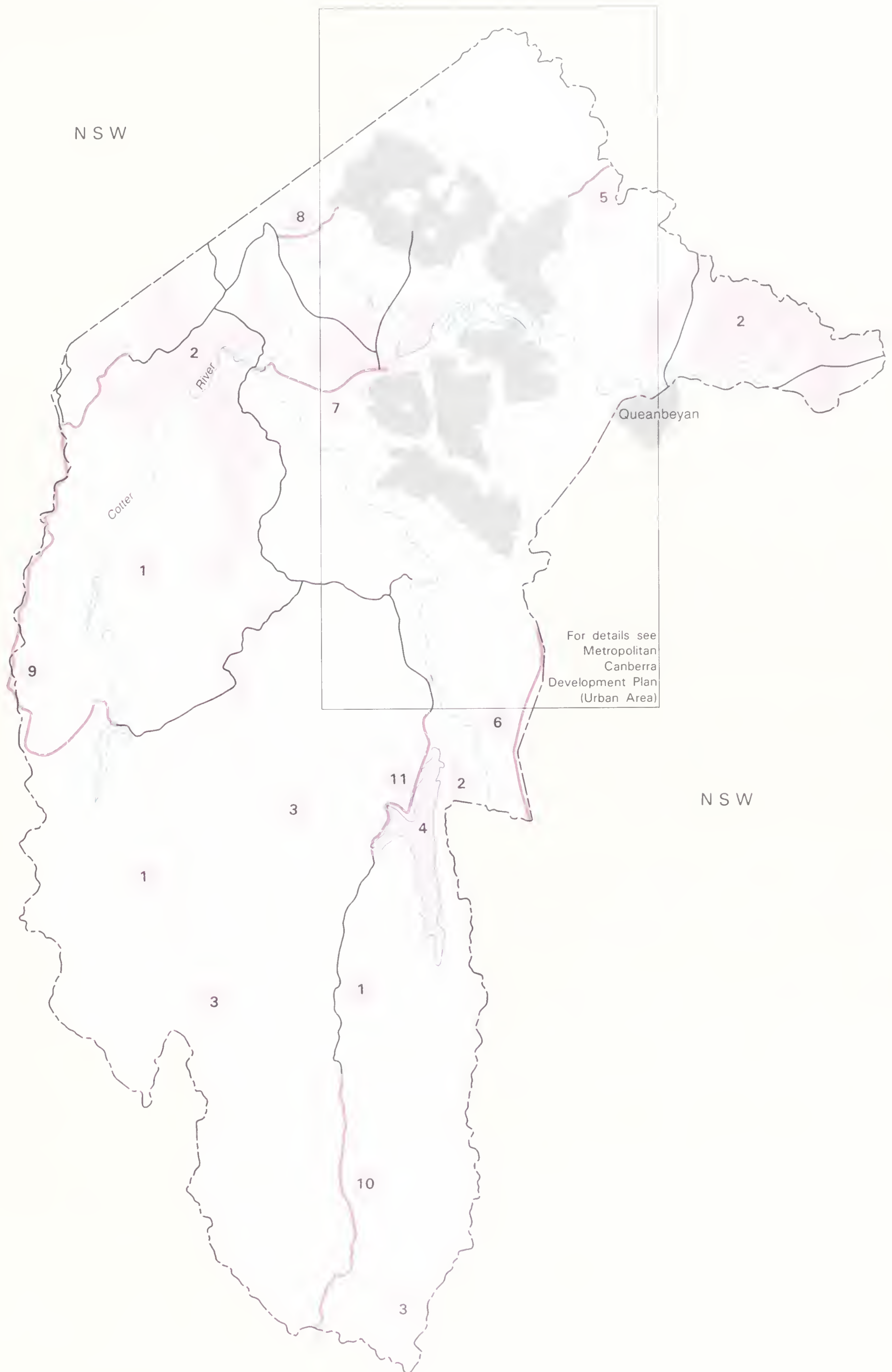


Figure 65 Metropolitan Canberra Development Plan (ACT)



Forests

2. Investigation of Pine Plantations

Of the 1 453 km² of forest and pine plantations in the ACT 1 243 km² are covered by indigenous forests, generally on steep land, which should not be cleared. The indigenous forests are largely in the existing or proposed water catchment areas, or in areas proposed for future conservation.

Most of the 210 km² devoted to pine plantations comprise lands which are unsuitable for use other than recreation. They are generally in areas of potential erosion or which have been previously degraded by overgrazing. The Commission intends that the pine forests in Kowen should not be extended as commercial plantations, and that in selected areas such as the visual catchment of the Parliamentary Zone the pine forests should be replaced progressively with native species. Pine forests are regarded as a temporary use until there is a higher order use to replace them, especially in relation to Commonwealth Government needs. Economic, planning and landscape studies will be undertaken as required to determine the appropriate amount of pine plantation in the ACT in order to replace them where necessary in accordance with the overall landscape and recreational requirements of the National Capital.

Water Resources

3. Protection of Water Uses

All of the ACT constitutes a catchment area for the rivers, streams and lakes upon which the community is dependent for a range of uses. Decisions on land use and land use management within the catchment largely determine the ability of lakes and streams to sustain their uses for water supply or recreational purposes.

Water supply constitutes the most important use of water resources in the ACT. In the case of the Cotter Catchment Area, the provision of water supply has been dependent upon the maintenance of water inflow of high quality. Increasing pressure for recreational access to the area would necessitate upgrading of the level of water treatment at increased cost to the community.

Similarly, the protection of Lake Burley Griffin and its use for water sports is dependent on control of land use and water discharges in the catchment areas. A reduction of phosphorus discharges within the catchment is required as a matter of urgency..

More than half of the land in the ACT may be needed for water supply catchments in the long term. The Cotter and Googong systems will be fully utilised when the Canberra/Queanbeyan population reaches 450 000.

The Naas-Gudgenby catchment of 671 km² has been identified as a future possible major source of water supply.

Most of the grazing properties in the northern part of this catchment area would either be flooded or affected by the future construction of Tennent Reservoir. The residue of open land, immediately around the reservoir site, could come within the water quality control management zone. The steep lands beyond the management zone would require restoration of vegetation to control soil erosion and prevent siltation of the reservoir.

4. Augmentation of Water Supply

In view of the limited resource available to meet future demands, there is a need to:

- preserve the option to utilise the Naas-Gudgenby Catchment Area as a future source of water supply

- restrict the allocation of ACT water to the out- region
- instigate a programme aimed at reducing water consumption in the longer term.

On the basis of current consumption and projected population growth, augmentation of the water supply will need to commence within the plan period. Augmentation will require the construction of either a further dam within the Cotter Catchment Area, or the construction of the Tennent Reservoir on the Gudgenby River.

The Tennent Reservoir could supply water for an additional population of between 180 000 and 215 000. Construction work on the dam would need to begin during the plan period, approximately seven to nine years prior to its planned in-service date. The future Tennent Reservoir area, including a foreshore buffer zone, will be excluded from the Gudgenby Nature Reserve, to preserve the option of exploiting the Naas-Gudgenby Catchment Area for water supply purposes.

National Capital Entrance Routes

5. Federal Highway Duplication and Upgrading

The increasing ACT population and changing lifestyles will necessitate further development of regional roads. The Federal Highway is a major approach road to the National Capital and is in need of upgrading.

Improvement works will be undertaken and co-ordinated with associated works in New South Wales.

6. Reconstruction of Monaro Highway

The Monaro Highway is the main connection from Canberra to the southern region of New South Wales and is used extensively by traffic travelling to and from the Snowy Mountains. The NSW Department of Main Roads is progressively upgrading this road between Cooma and the ACT/NSW border. The road in the ACT is being similarly upgraded and construction has been completed to within 13.3 km of the border.

Design is currently in hand for the remaining length within the ACT to be constructed in three stages.

Rural Roads

7. Upgrading of Cotter Road

The Commission's emphasis in the future development of rural roads will be on upgrading those roads that provide access to facilities close to urban development to meet the trend towards increasing use of more local recreation areas. As part of this programme, the Cotter Road will be upgraded to improve safety and provide overtaking lanes in appropriate locations.

8. West Belconnen - Uriarra Road Connection

Access for Belconnen residents to the recreation areas on the Murrumbidgee and Cotter is presently by a circuitous route. A road connecting Stockdill Drive with Uriarra Road will be constructed and this will shorten the trip to the Uriarra and Cotter areas by between 10 and 15 km.

9. Brindabella Road - Mt. Franklin Road Upgrading, Mt. Franklin Road - Corin Road Connection

These works will complete a recreation and tourist route from the Cotter to Tharwa via the Brindabella Road, Picadilly Circus, Mt. Franklin, and the Corin Dam. The loop road created will provide views of the Snowy Mountains and the floodplain of the

Murrumbidgee. There are major environmental factors to be considered in the design. These include water quality in the Cotter Catchment, environmental impacts on the wilderness area the road would traverse, and regional recreation resources. The provision of the road will be considered in detail, as part of the studies for the Cotter Catchment Area Policy and Development Plan, which is currently in progress.

10. Boboyan Road Upgrading

This project is a continuation of work currently being undertaken to upgrade and seal the Boboyan Road to the ACT border. Earlier stages have involved reconstruction of the road south to the Gudgenby River crossing. This work will include reconstruction of the road south of the crossing and will take place on the existing road alignment. Minor adjustments will be carried out in a few locations to improve the geometry of sharp bends, consistent with the higher design speed and safety needs of the upgraded road. The new sealed road will serve regional needs and provide the major access into Gudgenby Nature Reserve.

11. Relocation of Naas Road

The construction of Tennent Reservoir will necessitate relocation of the northern part of the Naas Road higher up the slopes of Mt. Tennent. This road will remain as the northern entry route into Gudgenby Nature Reserve. It is the direct route between the Tharwa/Lanyon area and Gudgenby Nature Reserve, for recreational and tourist access and, in the long term, would establish the Riverview area as an entry point to the Gudgenby area and provide a spectacular lakeside drive along the edge of Tennent Reservoir. Ultimately it is expected to become a major tourist route.

Metropolitan Canberra Development Plan (Urban Area)

Substantial progress has been made in the development of Canberra as the National Capital and Seat of Government and as a city housing over 230 000 people, most of which has been achieved in the past two decades. While Canberra's 'boom' conditions of the early 1960s to the mid 1970s may not be repeated, considerable development needs will arise in the next two decades from natural increase in the population, changes in the demographic composition, net migration arising from public and private sector investment and job creation. In addition, there will be a wide range of demand for urban goods and services arising from changes in the urban fabric, technological and social changes and demand for services arising externally, such as from tourists and the regional population. Future National Capital functions and buildings still to be established would also generate demands.

This section of the Development Plan outlines, in broad terms, the key development works required during the next twenty years within the Canberra urban areas (Figure 66). These works are generally major elements of the metropolitan system, although it should be recognised that development of the scale envisaged over the next twenty years implies a large number and wide range of smaller development projects as well.

For example, the major elements of development the Commission normally provides under current arrangements in a new settlement area are as follows:

- residential land development
- water supply
- sewerage
- stormwater
- public housing
- education facilities
- roads and public transport
- parks and reserves
- municipal facilities
- commercial land development
- recreational and cultural facilities
- health and welfare facilities
- Commonwealth offices

Public utility services for electricity supply and telephone reticulation are provided by ACTEA and Telecom respectively, while the private sector is responsible for most housing development, retail centres, office accommodation for private and government use, development of tourist-related facilities, industrial development and some private education and health facilities.

It has been assumed that private enterprise development in the future is likely to be similar to that undertaken in the past. Many of the private sector activities are directed at meeting needs arising from population and employment growth, or its changing composition, such as housing, retail centres, offices and industrial development. Non-government education, health and welfare facilities are also related to population increase generally, or to emerging age-specific requirements, such as schools and aged persons facilities. Other private sector developments have been based on meeting National Capital and Seat of Government needs, including the establishment of national associations.

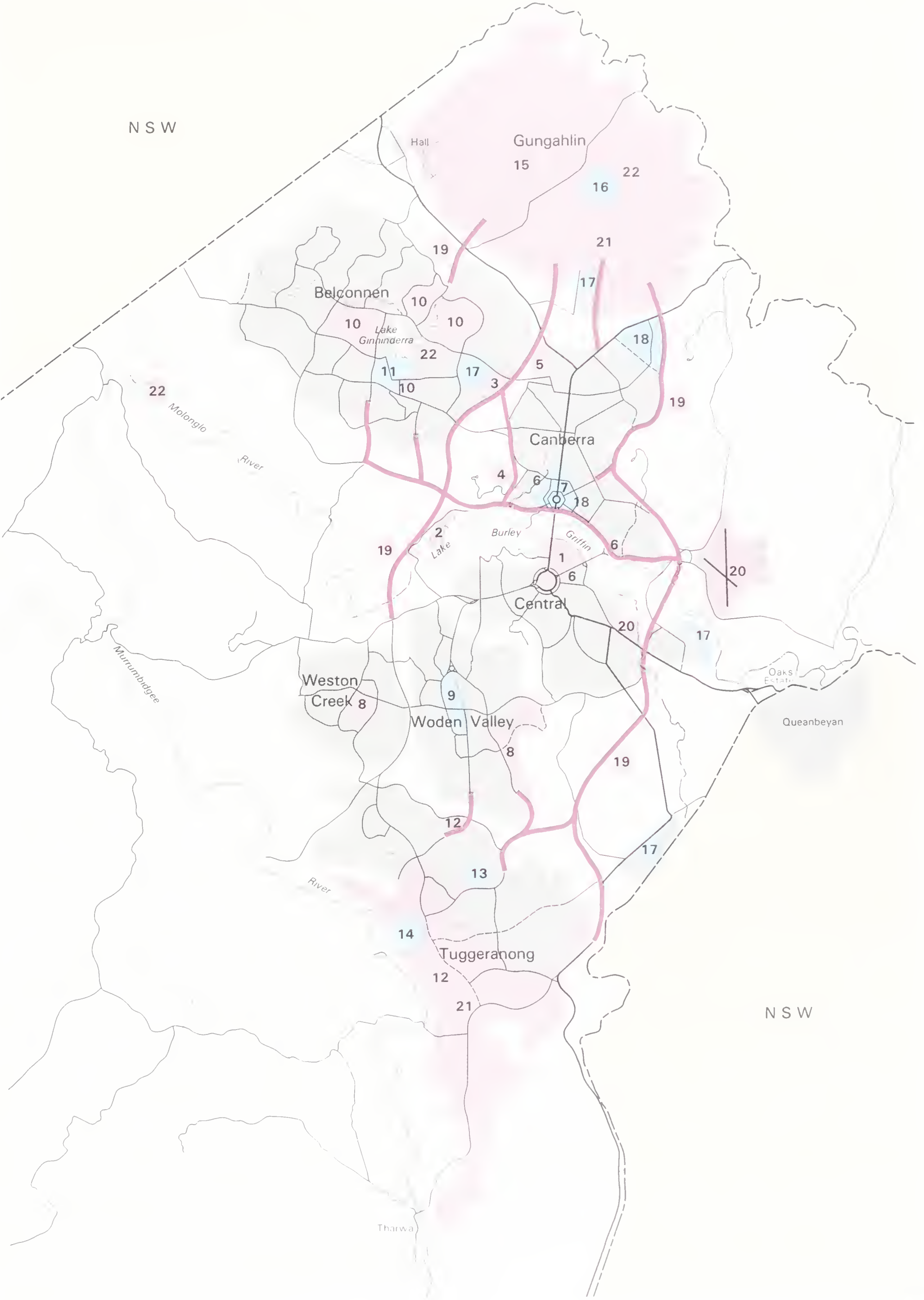
Major opportunities for private sector investment in the future will be in the areas of:

- housing (new construction, alterations and additions, redevelopment)
- commercial centre development (new development in existing and new centres, redevelopment in existing centres)
- tourism (accommodation, attractions, complementary facilities such as convention centres, etc.)
- manufacturing (development associated with construction industry; high technology, information and communications-related industries)
- health (facilities for health and welfare projects, such as hospitals, aged persons homes and nursing homes).

- | | |
|---|---|
| 1 Parliamentary Zone Development - works will be undertaken to meet the needs of Parliament, national institutions, tourism and public administration. | 12 Tuggeranong Land Settlement - the development of remainder of North-East Tuggeranong, the Town Centre and Lanyon. |
| 2 Museum of Australia Development - development of Museum at Yarramundi Reach, road access from Lady Denman Drive and complementary works such as car parking and landscaping | 13 Erindale Centre Retail Development - a 4 000m ² retail centre will be open by the time Tuggeranong's population reaches 50 000. |
| 3 Development of the National Sports Centre - progressive development as a sport and recreation venue and training facility. | 14 Tuggeranong Town Centre Development - the town centre development will commence within 2 years and will eventually have between 12 000 and 17 000 employment and between 40 000-50 000m ² of retail floorspace. |
| 4 Development of the National Botanic Gardens - further development including a Visitor Information Centre to enhance its landscape and visitor facilities. | 15 Gungahlin Land Settlement - settlement will commence in 1989-90 and the town will grow to an eventual population of 84 000. |
| 5 Inner Canberra Land Settlement and Urban Consolidation - development of North Lyneham, further redevelopment of Kingston. | 16 Gungahlin Town Centre Development - the centre will commence as a 5 000m ² group centre when the town's population is 20 000 and will eventually have employment of 7 000-12 000 and 47 000m ² retail floorspace |
| 6 Central Area Employment Expansion - Employment expansion of between 19 450 and 24 450 of which between 17 650 and 22 650 will be in Civic, Parkes/Barton and Russell/Campbell Park. | 17 Industrial Development - Fyshwick, Mitchell and Hume and the Canberra Technology Park will be developed to cater for likely demands over the next two decades. |
| 7 Civic Centre Employment Expansion and Retail Development - Civic Centre employment will grow by between 9 000 and 11 000 and its retail floorspace in the order of 15 000m ² . | 18 Development of Special Tourist Commercial Facilities - tourist facilities will be directed where possible to Civic and North Watson. |
| 8 Woden-Weston Creek Land Settlement - development will be consolidated by the development of Isaacs, Stirling and East O'Malley and vacant medium-density sites. | 19 Metropolitan Roads Upgrading or Development - the road network will be expanded to cater for expected population and employment growth. |
| 9 Woden Town Centre Employment Expansion and Retail Development - employment will grow to between 11 000 and 13 000, and its retail floorspace by up to 2 500m ² | 20 Upgrading of Airport and Railway Facilities - these facilities will be upgraded to cater for growth in tourist, business and government traffic. |
| 10 Belconnen Land Settlement - development will be consolidated by the development of vacant residential land including McKellar, Florey and the Belconnen Naval Station. | 21 Development of Major Electricity Network - the network will be expanded to cater for expected population and employment growth. |
| 11 Belconnen Town Centre Employment Expansion and Retail Development - employment will grow to between 8 000 and 13 000, and retail floorspace by up to 2 500m ² . | 22 Water Resources Infrastructure - the water, sewerage and storm-water networks will be expanded to cater for the expected population and employment growth. |



Figure 66 Metropolitan Canberra Development Plan (Urban Area)



The principal development works required during the next twenty years within the Canberra urban area are outlined below, under the following headings:

- National Capital facilities
- Inner Canberra
- Woden-Weston Creek
- Belconnen
- Tuggeranong
- Gungahlin
- industry
- tourism
- transport
- public utilities.

National Capital Facilities

1. Parliamentary Zone Development

Particular emphasis will be given to the development of the Parliamentary Zone over the next two decades to enhance Canberra's role as the National Capital.

The future development of the Parliamentary Zone is regarded by the Commission as falling into two phases. First, the Commission has identified a number of works, including roads, bridges and landscape elements, which should be completed, prior to the opening of the New Parliament House in 1988, to develop and enhance its setting and to provide the appropriate access to the building from the Parliamentary Zone.

Second, in the period after 1988, other buildings and works might occur to meet the needs of Parliament, national institutions, tourism and public administration. Any further development in the Parliamentary Zone should be located so as to consolidate the existing land-use structure and the setting created by the existing national institutions. The National Library, High Court and National Gallery are significant buildings and major tourist attractions. The Commission's detailed intentions regarding the future development of the Parliamentary Zone are contained in the *Parliamentary Zone Development Plan*.

Because of the role of the Parliamentary Zone as a tourist venue, it is the Commission's intention to upgrade tourist facilities and related transport systems progressively, to ameliorate the existing lack of legibility and the significant separation between buildings in the Zone.

2. Museum of Australia Development

An area of 90 ha has been set aside adjacent to Yarramundi Reach, for the development of the Museum of Australia. The site offers an extensive lakeshore frontage, a variety of vegetation, and high quality surroundings, which will enhance the potential of the museum to integrate indoor and outdoor displays in innovative ways. The possibility also exists of a ferry link between the Museum and other national institutions in the Parliamentary Zone, such as the Australian National Gallery and the National Library of Australia.

Works which will be required include:

- development of the Museum facility itself, comprising public display spaces, visitor services, curatorial facilities, and educational services
- road access from Lady Denman Drive
- complementary works, such as car parking and landscaping.

3. Development of the National Sports Centre

The National Sports Centre at Bruce is being progressively developed by the Commission to provide both a venue for national and international sporting and recreation events, and facilities available for year-round training by sportsmen and sportswomen enrolled at the Australian Institute of Sport.

The developing complex currently comprises the National Athletics Stadium, the National Indoor Sports Centre, an Indoor Swimming Centre, a tennis hall, a warm-up hall for gymnasts and outdoor tennis courts. It provides facilities of Olympic standard for 22 indoor sports and athletics and a venue for National League Soccer matches.

A Development Plan for the National Sports Centre has been prepared by the Commission, which provides for further stages of development as the need arises.

4. Development of the National Botanic Gardens

The National Botanic Gardens will be further developed to enhance its landscape and visitor facilities. A Visitor Information Centre housing a theatrette, exhibition space, reference herbarium and book sales area will be located close to the main entrance and a Conservatory for tropical plants is under investigation.

An extension of 37 ha will be fenced, and progressively developed. Paths and roads will be provided for public access.

Public parking provision is to be increased and an underpass beneath Black Mountain Drive established to connect the two sections of Gardens.

A Development Plan will be prepared to guide the future development of the expanded National Botanic Gardens.

Inner Canberra

5. Inner Canberra Land Settlement and Urban Consolidation

North Lyneham is the only major area of vacant land yet to be developed in Inner Canberra. It will accommodate an eventual population of about 1 600. Settlement will commence within the next four years. It is envisaged that a small shop site will be released in the development.

Redevelopment of the older parts of Canberra, such as Kingston, will continue, but it is unlikely that an increase in the number of dwellings through redevelopment will create corresponding increases in population. The Commission will continue to investigate options for consolidation and redevelopment. Studies will be carried out on an area-by-area basis with a view to introducing local area policies to guide redevelopment.

Inner Canberra will remain the central focus for tourist attractions associated with National Capital and metropolitan functions, and for tourist accommodation.

Other projects likely to accommodate local employment growth in the plan period include the West Deakin office area and Section 67 Deakin diplomatic area, which will be progressively developed.

6. Central Area Employment Expansion

The Central Area is a particularly sensitive environment of Canberra, as it embraces the Parliamentary Zone. Care has to be taken to ensure that traffic pressures do not overwhelm it.

Within the plan period, employment in the Central Area is planned to increase from 44 850 to between 64 300 and 69 300, with substantial

employment expansion occurring in Civic (9 000 to 11 000 increase), Parkes/Barton (4 350 to 7 350 increase), and Russell/Campbell Park (4 300 increase).

Expansion in Civic provides the greatest opportunities for the private sector in the Central Area to cater for the office, retailing, personal service, and recreational demands generated by the area's workforce and population. The opportunities for the private sector elsewhere in the Central Area will be primarily in the construction of office accommodation in Parkes/Barton and Russell/Campbell Park.

An indication of the possible build-up of employment in the Central Area is shown in Table 99.

Table 99 Central Area Employment Expansion

	1982	1987	1992	1997	2002	2003
Civic Centre	16 000	22 000-23 500	23 000-25 000	24 000-25 500	24 500-26 000	25 000-27 000
Parkes/Barton	10 650	11 000-13 000	12 500-15 000	14 000-16 000	14 800-17 700	15 000-18 000
Russell/Campbell Park	6 600	7 000	8 500	9 600	10 700	10 900
Other	11 600	12 000	12 500	12 900	13 300	13 400
Total	44 850	52 000-55 500	56 500-61 000	60 500-64 000	63 300-67 700	64 300-69 300

- Civic Centre
Civic's employment is expected to grow to between 25 000 and 27 000 within the plan period, as Civic consolidates its metropolitan role as the major office employment centre. Beyond the 25 000 to 27 000 employment level, the transport costs, in terms of congestion, road capacity and car parking, would increase substantially.
- Russell/Campbell Park
These nodes will grow in accordance with the expansion in the Defence Department.
- Parkes/Barton
As the location for the key policy departments, Parkes/Barton will grow as a result of the growth in the Australian Public Service, and through the establishment and growth of national institutions, such as the New Parliament House, National Archives Headquarters, the National Library, High Court and the National Gallery.
- Acton
Expansion in the Australian National University, CSIRO, and Royal Canberra Hospital employment is expected to be slow in the plan period.
- Duntroon/ADFA
Expansion of employment will occur in this area, as a result of the establishment of the Australian Defence Forces Academy.

7. Civic Centre Employment Expansion and Retail Development

In order for Civic to better serve the population of North and South Canberra, and to facilitate its metropolitan role, an expansion of retailing in the order of 15 000m² will be encouraged, through the release of Section 38. It is intended that the site will be released within the next two years.

Also likely in the plan period is the redevelopment, or refurbishment, of some of the older commercial premises in Civic Centre, which would achieve consolidation of retail activity, promote the introduction of new retail layouts and encourage further modernisation of retail facilities within Civic.

To encourage Civic Centre to develop its metropolitan role, road and parking facilities will be progressively improved. In order to increase accessibility and enhance the physical environment by upgrading public spaces and landscape. A car parking structure will be developed in Civic in the next two to three years, to relieve existing parking pressures. Construction may be carried out by the Commission or private enterprise. Development works which will be carried out in Civic are described in the Civic Centre Policy Plan and Development Plan.

Woden - Weston Creek

8. Woden - Weston Creek Land Settlement

The development of the urban area is to be consolidated by the servicing of residential areas in Isaacs, Stirling and East O'Malley, and vacant medium-density housing sites. These areas have an eventual population capacity of about 6 500. Isaacs will commence settlement in the next four years, and Stirling will commence settlement in the next year.

A local shop site will be released in Isaacs by the time the neighbourhood is about 50 per cent settled.

9. Woden Town Centre Employment Expansion and Retail Development

Woden Town Centre employment will be planned to expand to between 11 000 and 13 000, through the growth of activities currently located at the centre and the consolidation of its role as the community focus for Woden-Weston Creek.

Mixed-use retail developments will be permitted, although their expansion will be constrained to enable release of Section 38 City and the Tuggeranong Town Centre. An overall release of 2 500m² of retail floorspace will be permitted in Woden Town Centre in the plan period.

A car parking structure will need to be developed in Woden Town Centre over the next few years to accommodate increasing demand. Construction may be carried out by the Commission or private enterprise.

Belconnen

10. Belconnen Land Settlement

The development of the town will be consolidated by the development of McKellar and Florey, smaller infill subdivisions and vacant medium-density housing sites. The eventual population capacity of these housing areas is about 14 000.

The Belconnen Naval Station is expected to be relocated within the next decade. The area will be used for residential purposes, accommodating an eventual population of about 3 600.

Currently, land in McKellar is being released and land in Florey will become available within the next two years. Shop sites will become available when the settlement is about 50 per cent complete in each area. Primary schools will be developed in Florey and McKellar.

11. Belconnen Town Centre Employment Expansion and Retail Development

Employment in the Belconnen Town Centre is planned to grow from 8 000 to between 13 000 and 15 000, in response to the expansion of activities located in the centre and in its role as the community focus for Belconnen. An overall increase of 2 500m² of retail floorspace will be permitted in Belconnen Town Centre in the plan period.

Employment in Bruce is also likely to expand, in response to the growth of the Australian Institute of Sport, the Canberra College of Advanced Education, the Bruce College of Technical and Further Education, Radford College, Calvary Hospital and the establishment and development of the Canberra Technology Park.

Tuggeranong

12. Tuggeranong Land Settlement

The development of Tuggeranong will proceed to an eventual population of approximately 85 000-90 000. The remainder of North-East Tuggeranong, the Town Centre and Lanyon will be substantially developed, prior to the commencement of Gungahlin.

A lake will be developed in Tuggeranong, as a multi-use facility, providing recreational opportunities, landscaped areas, stormwater drainage and pollution control for protection of the Murrumbidgee River.

At the local level, about 20 000m² of retail floorspace will be released at centres in Chisholm, Calwell, Isabella Plains, Theodore, Fadden and Lanyon. The timing of the releases will be related to the population growth within each of these areas.

13. Erindale Centre Retail Development

The Erindale Centre (4 000 m²) is planned to be open when the town population approaches 50 000.

14. Tuggeranong Town Centre Development

The development of town centre retailing in Tuggeranong has been related to the population growth in Tuggeranong and the overall metropolitan supply of retail floorspace. The eventual size of the retail component of Tuggeranong Town Centre is intended to be between 40 000m² and 50 000m². Detailed planning of the Town Centre has commenced in order to facilitate the development of a shopping centre and support retail and service trades uses. In March 1984 it was proposed that 24 000m² could comprise the first stage release of retail floorspace. The extension of Athllon, Erindale and Isabella Drives are being designed to support the development of the Town Centre. These works will also include the dam to create Lake Tuggeranong.

The growth of employment in the Tuggeranong Town Centre has been related to the employment growth within Canberra, in particular the growth of Public Service Act office employment. Public Service Act office employment is likely to grow by 20 300 during the plan period, of which it is intended that between 6 000 and 8 500 will be located in the Tuggeranong Town Centre. A 10 000m² building to accommodate 500 office workers will be commenced within two years. An indication of the intended employment expansion in the Tuggeranong Town Centre is shown in Table 100.

Table 100 Tuggeranong Town Centre Employment Expansion

	Tuggeranong Population	PSA Employment at TTC	Total Employment at TTC (1)
1982	32 800	-	-
1987	57 000	500-1 500	1 500- 2 500
1992	88 500	3 800-5 400	7 600-10 800
1997	90 000	5 000-7 100	10 000-14 200
2002	89 000	5 900-8 400	11 800-16 800
2003	89 000	6 000-8 500	12 000-17 000

(1) Assumes PSA office employment is 50 per cent of total employment at the centre.

The development of the Town Centre will provide substantial investment opportunities for the private sector in terms of the construction and leasing of retail, office, service trades, community and recreational facilities.

Gungahlin

15. Gungahlin Land Settlement

The development of Gungahlin will proceed to an eventual population of approximately 84 000.

At the local level, approximately 25 000 m² of retail floorspace will be released at group centres and local centres.

Full Gungahlin development, without constraints on nutrient levels, could reduce water quality in Lake Ginninderra to a point detrimental to the use of the lake. It will therefore be necessary to ensure that means of containing nutrients are incorporated into the planning of Gungahlin's infrastructure. In particular, structures will be developed, which will protect Lake Ginninderra against the water pollution caused by land servicing in Gungahlin.

The future form and structure of Gungahlin development will be carefully investigated, with respect to water quality implications and in order to ascertain whether or not higher average densities and different lifestyles could be achieved.

16. Gungahlin Town Centre Development

It is intended that the first stage of the Town Centre, comprising a 5 000 m² group centre, will be operating by the time the town's population is 20 000. The level of floorspace will increase with the town's population. An indicative build-up of floorspace is contained in Table 101.

Table 101 Gungahlin Town Centre Retail Development

Gungahlin Population	Gungahlin Town Centre Floorspace (m ²)
20 000	5 000
35 000	20 000
60 000	40 000
80 000	47 000

Employment growth at Gungahlin Town Centre will be related to the total growth in employment opportunities in the plan period, particularly the growth in Public Service Act office employment. Within the plan period, Gungahlin Town Centre is likely to attract between 3 500 and 6 000 Public Service Act office jobs. An indication of employment growth in the Gungahlin Town Centre is shown in Table 102.

Table 102 Gungahlin Town Centre Employment Expansion

	Gungahlin Population	PSA Employment at GTC	Total Employment at GTC (1)
1982	-	-	-
1987	-	-	-
1992	10 000	-	-
1997	50 000	1 700-2 250	3 400- 4 500
2002	80 000	3 200-5 700	6 400-11 400
2003	84 000	3 500-6 000	7 000-12 000

(1) Assumes PSA office employment is 50 per cent of total employment at the centre.

Industry

17. Industrial Development

Industrial land will continue to be developed in Fyshwick, Hume and Mitchell. These areas have adequate capacity to cater for likely demands over the next two decades, although various improvements will be made to the estates to increase their attractiveness. In addition, the Canberra Technology Park at Bruce has been identified for development of high technology industry.

Another area at West Belconnen has been identified for longer-term industrial needs. There should, therefore, be no further need to select new locations for industrial areas during the next twenty years, unless special purpose industries with specific and new needs arise.

Tourism

18. Development of Special Tourist Commercial Facilities

Tourist facilities will be directed, where possible, into Civic Centre or the Special Tourist Commercial Area at North Watson, thereby consolidating the existing tourist-oriented facilities in these areas. Possible developments include facilities providing entertainment, recreation, accommodation or similar complementary services to the touring or holidaying public. Designated tourist routes will be consolidated through the provision of appropriate facilities, amenities and signposting, and by siting new tourist developments in locations which facilitate interaction with other land uses.

Transport

19. Metropolitan Roads Upgrading or Development

To accommodate the additional traffic generated by future population in Tuggeranong and Gungahlin, and any new development within the existing urban area, the metropolitan road system will need to be extended during the plan period by the following major elements.

- **Eastern Parkway**
The Eastern Parkway is required to service the future population growth in Tuggeranong. It will relieve congestion on the existing major arterials and provide an alternative route to the Central Area and other east Canberra destinations.
The first stage of the Eastern Parkway, between Morshead Drive and Jerrabomberra Avenue, is programmed for construction within the next three years. The second stage, from Jerrabomberra Avenue into Tuggeranong, will be needed by the time Tuggeranong's population reaches approximately 55 000-60 000. It will be progressively upgraded as Tuggeranong's population grows to its intended eventual size, and will be subject to engineering and environmental studies.
- **Erindale Drive**
Erindale Drive will be upgraded to a minimum of two lanes each way before the second stage of the Eastern Parkway is constructed.
- **Erindale Drive - Eastern Parkway Connection**
A new arterial link from Erindale Drive to the Eastern Parkway will be constructed, in conjunction with the development of the Eastern Parkway (i.e. at about the time Tuggeranong reaches a population of 55 000-60 000).
- **Flemington Road**
Flemington Road will be duplicated to improve the efficiency of the existing North Canberra road system.
- **Monash Drive and John Dedman Parkway**
The first of two new major roads (Monash Drive and John Dedman Parkway) to service inter-town traffic from Gungahlin

will be needed by the time Gungahlin's population reaches approximately 5 000.

The construction of the second of these new major roads will need to begin by the time Gungahlin's population reaches approximately 50 000-55 000.

John Dedman Parkway will be constructed on an alignment east of the National Sports Centre and will connect with Caswell Drive at Belconnen Way. An arterial connection will be made on the eastern side of Black Mountain to Parkes Way.

Monash Drive will be constructed west of Mount Ainslie and Mount Majura and will connect with the proposed Eastern Parkway at Morshead Drive.

- **Eastern Parkway - Monash Drive Connection**
An arterial connection between the Eastern Parkway and Monash Drive will be constructed, in conjunction with Monash Drive
- **William Slim Drive**
William Slim Drive from Aikman Drive to the Barton Highway, will be upgraded to a dual carriageway facility and realigned to east of Lake Ginninderra to service traffic from Gungahlin.
- **Upgrading of Existing Parkways**
The upgrading of Tuggeranong Parkway and Parkes Way to Coranderrk Street, will be progressively carried out as traffic demands warrant. The further development of Glenloch Interchange will be undertaken in conjunction with these works.
- **William Hovell Drive**
William Hovell Drive will be progressively upgraded as traffic demands warrant.
- **Caswell Drive and Bindubi Street**
Caswell Drive and Bindubi Street will be upgraded to four-lane arterial roads in conjunction with the upgrading of William Hovell Drive.
- **Morshead Drive**
The duplication of Morshead Drive will be undertaken in conjunction with the first stage of the Eastern Parkway.
- **Fairbairn Avenue**
Fairbairn Avenue will be duplicated when traffic demands warrant.
- **Athllon Drive**
The duplication of Athllon Drive and its realignment to provide more direct access to the Woden Town Centre will be constructed within the next ten years.

20. Upgrading of Airport and Railway Facilities

A need to upgrade existing airport facilities in Canberra has been identified. It is envisaged that the facility will remain a domestic airport. The possibility exists for a new terminal to be developed. If this occurs the existing terminal would be made available for an alternative purpose, such as general aviation.

The Australian National Railways Commission has a longstanding proposal for a Canberra-Yass railway and, more recently, a proposal for a new link to join the Melbourne-Sydney line between Yass and Goulburn, replacing the existing line and reducing the Canberra-Melbourne distance. As the population increases, pressure for improved rail connections and facilities also will increase. As well as a new track, a new station and freight handling facility may be required. In addition, because the railway is a major approach route to the National Capital, landscape improvements will be carried out to upgrade the scenic quality along and visible from the route

Public Utilities

21. Development of Major Electricity Network

The development of the major electricity network which will be required over the next two decades can be tentatively described as follows:

- with the expected growth of population and land servicing in Tuggeranong it will be necessary to extend the 132 kV subtransmission network and provide a 132 kV/11 kV substation in Gilmore by 1986 and at Conder by the end of the decade
- it is necessary to link the Tuggeranong 132 kV network back to the new Causeway 132 kV/11 kV substation to ensure capacity and security of supply to the New Parliament House
- some penetration of Gungahlin will be necessary. This will be subject to further detailed investigation.

22. Water Resources Infrastructure

The provision of services to the new settlement areas, and the containment of impacts of metropolitan growth on existing uses of lakes and streams, will require the development and augmentation of hydraulic infrastructure. The following items constitute the major elements in the programme.

a) Water Supply:

- the provision of a direct link from Googong to the Tuggeranong bulk water supply, and the southern extension of the bulk water supply system to service Lanyon
- extension of the Belconnen bulk water supply system to north and west Gungahlin, and the extension of the Googong Main from Campbell to east Gungahlin

b) Sewerage:

- construction of a trunk sewer to service Lanyon
- extension of the Ginninderra and Sullivan's Creek trunk sewers to service Gungahlin, and construction of the North Molonglo Valley Interceptor Sewer tunnel to service the increased load on Sullivan's Creek system resulting from the development of Gungahlin
- augmentation of the capacity of the Lower Molonglo Water Quality Control Centre

c) Stormwater and Water Pollution Control:

- provision of a water pollution control pond at Point Hut, and provision of main drains in Conder and Banks
- extension of Ginninderra and Sullivan's Creek drains to service Gungahlin and construction of a number of water pollution control ponds as the means of containing pollution from urban runoff.

Implementation

On the forecast rate of growth, land for development in the existing towns and in North - East Tuggeranong is expected to be largely developed by the financial year 1987-88. By this time, land will be required for development in another settlement area, with the choice being either Lanyon or Gungahlin.

Under the population growth projected in the plan period and the Commission's current preferred settlement sequence within Gungahlin, land in Gungahlin would not be available in 1987-88.

The planning for Gungahlin has commenced; however, first land turn-off is unlikely to occur until 1989-90, because of the lengthy pipelines involved in planning and in providing major infrastructure elements. The planning and development pipeline for a new town is six-and-a-half years between initial planning and first settlement. Lanyon, as a result of its more advanced stage of planning (Conder, its first suburb, is already gazetted) can be available for settlement in 1987-88.

NCDC Publications
Audio-Visual Presentations

The National Capital Development Commission, the statutory body charged with the planning and development of Canberra as the National Capital of Australia publishes for purchase a wide range of reports and technical papers which provide information on many of its activities.

In addition, to cater for a demand for visual information on Canberra in the form of 35 mm slides, NCDC has available an audio-visual programme consisting of attractive vinyl wallets containing 39 colour slides, pre-recorded commentary on cassette and printed information. This set is available in English or Japanese for \$25.00 plus \$2.50 postage. There is also a small kit of 12 slides, with printed information available for \$5.00 plus 90 cents postage.

The publications listed can be purchased at NCDC's offices, 220 Northbourne Avenue, Canberra or by forwarding your order with a cheque or financial authorisation to cover cost and postage to:

Publications Sales
National Capital Development Commission
GPO Box 373
CANBERRA 2601 ACT Australia

The reports document major planning issues in the Commission's operations. They are intended to keep the public aware of the broad planning base from which NCDC works as well as providing professionals with documents which can be identified as current planning statements for the ACT.

The Technical Paper Series provides general information on Commission operations as well as setting out in some detail information on certain projects in which NCDC has acquired technical or operational expertise. Technical papers are prepared with a view to encouraging informed professional and general public comment.

Technical Papers

- No. 1 The Role of the Social Planning Group within the NCDC *October 1974.*
- No. 2 Molonglo Arterial Canberra *January 1975.*
- No. 3 Operational Review in the NCDC Revised edition *November 1976.*
- No. 4 Housing requirements of the Aged: Social & Psychological Aspects *February 1975.*
- No. 5 National Sports Centre Bruce—out of print
- No. 6 Submission by the NCDC to the Royal Commission on Australian Government Administration *February 1975.*
- No. 7 Canberra: Demographic & Social Background. Revised edition *May 1977.*
- No. 8 An introduction to Corporate Planning—out of print
- No. 9 Project Management *June 1975.*
- No.10 Resident Satisfaction and Design Effectiveness of Two-Storey Flats. *July 1975.*
- No.11 Planning Brief for Lanyon Territorial Unit *August 1975.*
- No.12 Population and Labour Force Projections for Canberra and Queanbeyan 1976-1986. Revised edition *December 1976.*
- No.13 Social and Psychological Needs Related to Residential Density and Housing Form *April 1976.*
- No.14 The Use of Environmental Impact Statements in Environmental Planning *April 1976.*
- No.15 District Plan for Florey Neighbourhood, Belconnen *October 1976*—out of print.
- No.16 Monitoring Survey of Medium Density Housing in Canberra and Queanbeyan *December 1976.*
- No.17 District Plan for Isaacs, Woden-Weston Creek *January 1977.*
- No.18 Government and Community Involvement in Planning and Development of Canberra *April 1977.*
 - Part I Submission to the Parliamentary Joint Committee on the ACT
 - Part II Background Paper: NCDC Powers & Procedures.
 - Part III Background Paper: Public Participation in Planning.
- No.19 Structure Plan for West Murrumbidgee, Tuggeranong *May 1977.*

- No.20 Guidelines for Subdivision *July 1977*
- No.21 Urban Open Space Guidelines. Revised edition *January 1981*
- No.22 Low Energy House Design for Temperate Climates *August 1977*
- No.23 An Open Space System for Canberra: A Policy Review *October 1977*
- No.24 Tuggeranong: The Views of Some Early Residents *November 1977*.
- No.25 Traffic Noise and its Effect on Site Selection and Design of Dwellings *April 1978*.
- No.26 Canberra Schools in the 1980s *May 1978*.
- No.27 NCDC Corporate Planning *July 1978*.
- No.28 Causeway Redevelopment: A Case Study in Public Participation *May 1980*.
- No.29 Monitoring Stormwater Flow and Water Quality in Paired Rural and Urban Catchments in the ACT *August 1980*.
- No.30 Waters of the Canberra Region *April 1981*.
- No.31 Retailing in Canberra *May 1981*.
- No.32 Monitoring River Recreation Demand in the ACT *June 1981*.
- No.33 Murrumbidgee River Ecological Study *July 1981*.
- No.34 Utilisation and Protection of the Murrumbidgee River System in the ACT *July 1981*.
- No.35 Narrabundah Regeneration *March 1983*.
- No.36 A Play Area for Kambah District Park. *September 1983*.
- No.37 Cycleways, *September 1983*.
- No.38 Canberra's Population Projection 1983-1993 *November 1983*.
- No.39 Selection of a Site for The Museum of Australia. *March 1984*.
- No.40 Canberra's Economic Climate Assessment, Development Prospects 1984-1988. *April 1984*.
- No.41 Guide-Sign Manual. *April 1984*.
- No.42 The Ecological Resources of the ACT. *May 1984*.

Reports

- Tomorrow's Canberra *May 1970*.
- A Land Use Plan for ACT *March 1975*.
- Glenloch Interchange and Associated Roads
- Environmental Impact Statement: Supplementary Report *November 1977*.
- Yarralumla Policy Plan Report on Environmental Issues *February 1979*.
- Yarralumla Policy Plan Supplementary Report on Environmental Issues *March 1980*.
- 22nd Annual Report *October 1979*.
- 23rd Annual Report *September 1980*.
- 24th Annual Report *October 1981*.
- 25th Annual Report *October 1982*.
- 26th Annual Report *December 1983*.
- Works of Art in Canberra *December 1980*.
- Guidelines on Engineering and Environmental Practices—Hydraulics *June 1981*.
- Civic Centre: Policy Plan Development Plan for Discussion *February 1982*.
- Parliamentary Zone Draft Development Plan *June 1982*.
- Basic Specifications: Roads, Hydraulics Services and Landscape *Edition No. 2 October 1982*.
- Erindale Centre Development Plan *November 1982*.
- Erindale District Centre, Policy Plan Development Plan *July 1983*.
- Murrumbidgee River Corridor Policy Plan Development Plan. Draft for Discussion *October 1983*.
- Civic Centre Canberra Policy Plan Development Plan *February 1984*.

Audio-Visual Presentations

- Programme AVS1-7/82: Canberra, Australia's National Capital—39 slides and cassette.
- Programme AVS2 - 12/83: Canberra, The Garden City—39 slides and cassette.
- Programme SK1-5/84: 12-slide presentation and script on Canberra.

Guidelines on Engineering and Environmental Practices

The following guideline documents are available for loan from the NCDC Library, or may be purchased from the Commission's Publications Office.

- Hydraulics—June 1981.
- Public Lighting—July 1983.

